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THE THERMAL CONDUCTIVITY OF SELECTED FLANNEL AND SERGE FABRICS BEFORE AND AFTER WEAR*

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The results of studies of the thermal conductivity of certain flannels and serge fabrics when new, after periods of drycleaning alone, and after wear plus drycleaning are presented. The fabrics included three weights of serge and five flannels, which varied in composition from all new wool to all reused wool.

INTRODUCTION

THE usefulness of textile fabrics is largely determined by the fundamental properties both of the fiber and the fabric. For clothing, the ability of wool fabrics to serve as insulation against heat losses from the body is of paramount importance for a considerable portion of the year in many regions. The variation in thermal conductivity to be expected from differences 1) in the arrangement of wool fibers in the yarn, 2) in the quality of wool fiber, 3) in the weight of the fabric, and 4) due to wear and/or drycleaning have been indicated by measurements made on three weights of serge (worsteds), and on five flannels (woolens). The latter varied in compostion from all new wool to all reused wool.

Earlier studies of the serviceability of these two groups of wool materials have led to a consideration of their efficiency in providing comfort to the wearer in temperate and cold climates. During wear and drycleaning certain changes in the fabric may occur which will affect its insulating ability. For example, if a fabric shrinks and becomes more compact there may be a concurrent increase in insulating ability. Since the changes that do occur will depend on the fiber content and construction of the fabric, all clothing fabrics will not react identically in this respect. Therefore, the thermal conductivity of the flannels and serges studied was measured when new, after drycleaning only, and after wear and drycleaning.

EXPERIMENTAL PROCEDURE

The characteristics of all eight fabrics when new, after three periods of drycleaning alone, and after three periods of wear plus drycleaning, have been reported previously *(3, 4)*. Skirts were made from the flannels and trousers from the serges for the wear studies. Wear periods I, II, and III for the flannels consisted of 1000, 2000, and 3000 hours of wear, respectively. One flannel, that was made entirely of reused wool, was not subjected to 3000 hours of wear since a sufficient number of garments were not available. After every 200 hours of service each garment was drycleaned. The wear periods for the serge fabrics consisted of 1500, 3000, and 4500 hours, the garments being drycleaned after every 300 hours of wear.

Measurements of thermal conductivity were made with a Cenco-Fitch heat transfer apparatus, which had been so modified that the distance between the heat source and receiver could be adjusted with an accuracy of 0.001 inch. The distance between the heat source and receiver was set to correspond to the measured thickness of the specimen, the temperature of heat source being maintained at 100°C during the determinations. From the galvanometer readings thermal conductivity (C) and thermal conductivity per unit thickness (K) have been calculated.

DATA AND DISCUSSION

DIFFERENCES AMONG THE FLANNEL FABRICS———Mean values for the various properties associated with thermal conductivity which were determined for the flannel fabrics are given in Table I. Since conductivity is a unit of measure for the amount of heat which may be transferred through a given area in a given time, a fabric with a high "C" value will allow heat to be lost from the body more rapidly than one with a low "C" value. No significant differences have been found among the conductivity values for the flannel fabrics containing varying amounts of new wool, either when new or after wear and/or drycleaning. Apparently, the proportion of wool in these flannels had no effect on thermal conductivity according to the method of measurement used in this investigation. Rogers *et al (6)* also noted similar results in their study of blankets manufactured from good quality new wool blended with new wool of poor quality, with reworked wool, and with mohair. On the other hand, Hays, *et al (2)* found blankets made of reworked wool to be poorer insulators than those made of new wool. Both of these investigators used methods of measurement somewhat different from the method employed for this work. While changes in conductivity were observed with drycleaning and wear, these changes appear to be similar regardless of the percentage content of new wool in the flannels, and no trend for any one of these fabrics to change in conductivity more rapidly than any other fabric was observed.

After being drycleaned five times, none of the flannels changed significantly in conductivity although significant decreases were found for two of those materials after fifteen drycleanings. The mean values for the other flannels were not significantly lower after drycleaning than those for the new fabrics, although numerically these were six and eight percent lower than the values for the new fabrics. After ten drycleanings, four of the five flannels increased significantly in conductivity. This anomalous behavior was probably due to some irregularity in that particular processing. Since shrinkage may

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TABLE I

MEAN VALUES FOR PROPERTIES ASSOCIATED WITH THERMAL CONDUCTIVITY——FLANNELS

Treatment	New wool in fabrics (%)	Conductance (cal/°C) (sec cm²)	Conductance per unit thickness (cal cm/°C sec) (cm²)	Thickness (inches)	Density (g/cc)
New	100	0.00054	0.00011	0.082	0.1514
	75	0.00053	0.00011	0.082	0.1457
	50	0.00055	0.00012	0.084	0.1427
	25	0.00056	0.00012	0.082	0.1382
	0	0.00055	0.00012	0.083	0.1228
Drycleaned five times	100	0.00056	0.00012	0.083	0.1741
	75	0.00056	0.00012	0.081	0.1693
	50	0.00054	0.00012	0.084	0.1612
	25	0.00054	0.00011	0.081	0.1638
	0	0.00050	0.00010	0.084	0.1415
Drycleaned ten times	100	0.00061	0.00012	0.076	0.2006
	75	0.00053	0.00011	0.078	0.1847
	50	0.00065	0.00012	0.073	0.2002
	25	0.00062	0.00011	0.072	0.1926
	0	0.00060	0.00011	0.074	0.1596
Drycleaned fifteen times	100	0.00049	0.00012	0.092	0.1614
	75	0.00046	0.00011	0.093	0.1540
	50	0.00052	0.00012	0.091	0.1581
	25	0.00052	0.00012	0.088	0.1529
	0	No data			
Wear period I (1000 hrs +) (5 drycleanings)	100	0.00059	0.00011	0.075	0.1668
	75	0.00060	0.00011	0.074	0.1613
	50	0.00058	0.00011	0.076	0.1577
	25	0.00060	0.00012	0.076	0.1516
	0	0.00057	0.00011	0.074	0.1325
Wear period II (200 hrs + 10) (drycleanings)	100	0.00061	0.00011	0.070	0.1805
	75	0.00062	0.00011	0.068	0.1755
	50	0.00061	0.00010	0.068	0.1743
	25	0.00061	0.00010	0.069	0.1647
	0	0.00061	0.00010	0.067	0.1303
Wear period III (3000 hrs + 15) (drycleanings)	100	0.00062	0.00011	0.069	0.1772
	75	0.00059	0.00011	0.071	0.1616
	50	0.00061	0.00011	0.070	0.1622
	25	0.00061	0.00011	0.069	0.1579
	0	No data			

occur in drycleaning, causing a concurrent increase in thickness, a decrease in conductivity with drycleaning might have been expected.

The conductivity values for the worn flannels in all cases were higher numerically than those for the new fabrics, although in only one half of the cases were these differences significant. After each wear period the fabrics containing 100 and 75 percent new wool had conductivity values significantly higher than those for the new fabrics; the flannels containing 50 and 25 percent new wool in no case had values significantly higher after wear than when new; while the fabric containing no new wool was significantly higher in conductivity after wear period II than when new, but not after wear period I. It is apparent that, while 15 drycleanings alone tended to decrease the conductivity of these fabrics, wear with 15 drycleanings tended to increase thermal conductivity and decrease their value as insulators against heat losses from the body.

Thermal conductivity per unit thickness was not found to differ significantly among the flannels. In addition, little or no numerical difference was found either for the new or worn fabrics. Since these materials had been constructed so as to be as nearly alike as possible, with the exception of the percentage content of new wool, the "K" values could be expected to be approximately constant.

The small numerical differences in thickness observed among these flannels were not found to be significant, either for the new or drycleaned and worn materials. Five drycleanings did not cause any significant changes in thickness, while, after ten drycleanings, all fabrics were found to be significantly thinner than when new. In contrast to this decrease after ten drycleanings, a significant increase was found for all fabrics after fifteen drycleanings. Drycleaning may be expected to cause an increase in thickness due to shrinkage, and the unexpected results obtained for the fabrics that had been drycleaned ten times can only be attributed to some irregularity in the drycleaning procedure. While drycleaning alone generally caused increases in thickness, wear plus drycleaning resulted in decreases. Significant decreases in thickness were observed in all cases for the worn fabrics, these being approximately 10 to 15 percent thinner than the new materials.

Although shrinkage may account for some of the changes in thickness after drycleaning, the manner in which the flannel fabric was handled during pressing probably had a greater influence on this measurement. If the fabric was subjected to heavy pressure, it would decrease in thickness; if not, and it was steamed sufficiently, it might increase. The drycleaning operation also would affect the thickness of worn fabrics, although during wear some of the fiber actually will be worn away with subsequent decreases in thickness. Changes in the thermal conductivity of fabrics after drycleaning also have been observed by other workers. Gilmroe *et al (1)* have reported an increase in the protective value of wool blankets after drycleaning, and Hay *et al (2)* found a decrease in the conductivity of blankets after laundering, which they attributed to a resultant shrinkage.

Changes in conductivity observed for the flannels after drycleaning and wear were associated in almost all cases with concurrent changes in thickness. This is shown by the high coefficient of correlation (—0.98) obtained from the mean values for conductivity and thickness. Many other investigators have found similar high correlation between thickness and conductivity, and it has been well established that thickness and low conductivity are closely associated *(5)*.

TABLE II

MEAN VALUES FOR PROPERTIES ASSOCIATED WITH THERMAL CONDUCTIVITY——SERGES

Treatment	Weight (oz/sq yd)	Conductance (cal/°C) (sec cm²)	Conductance per unit thickness (cal cm/°C) (sec cm²)	Thickness (inches)	Density (g/cc)
New	12	0.0030	0.00022	0.029	0.3650
	14	0.0025	0.00019	0.031	0.3821
	16	0.0023	0.00018	0.032	0.4237
Drycleaned five times	12	0.0020	0.00016	0.032	0.3275
	14	0.0020	0.00017	0.034	0.3535
	16	0.0016	0.00016	0.038	0.3663
Drycleaned ten times	12	0.0018	0.00015	0.032	0.3383
	14	0.0017	0.00014	0.034	0.3577
	16	0.0018	0.00016	0.036	0.3901
Drycleaned fifteen times	12	0.0018	0.00015	0.032	0.3389
	14	0.0017	0.00016	0.035	0.3510
	16	0.0019	0.00017	0.036	0.3837
Wear period I (1500 hrs +) (5 drycleanings)	12	0.0022	0.00018	0.031	0.3608
	14	0.0017	0.00014	0.032	0.3912
	16	0.0021	0.00018	0.034	0.4122
Wear period II (3000 hrs + 10) (drycleanings)	12	0.0019	0.00014	0.029	0.3474
	14	0.0020	0.00015	0.030	0.3766
	16	0.0018	0.00015	0.032	0.4127
Wear period III (4500 hrs + 15) (drycleanings)	12	0.0024	0.00016	0.027	0.3500
	14	0.0018	0.00014	0.030	0.3730
	16	0.0019	0.00015	0.031	0.3898

DIFFERENCES AMONG THE SERGE FABRICS———The three weights of serge were not found to differ significantly in conductance either when new or after wear and/or drycleaning, although mean values did decrease numerically with increasing weight, as shown in Table II. Little correlation has been found between thermal insulation and weight per unit area for various types of fabrics by other workers *(5)*. Only when increased weight per unit area was associated with increased thickness have they found an improvement in insulation. While the serge fabrics reported here did differ significantly in thickness, this difference evidently was not great enough to be reflected in a statistically significant difference in conductance.

All three cleaning periods resulted in significant decreases in conductance for the 12- and 14-ounce fabrics when compared with the new material, the two lighter weight serges being 33 and 20 percent lower after five drycleanings than when new. No such increase in insulating capacity was found for the 16-ounce serge.

Wear plus drycleaning also resulted in numerical decreases in conductance for the 12- and 14-ounce serges, but the values for these fabrics were found to be significantly lower than those for the new fabrics after wear periods I and II only. These decreases, however, were not as great numerically as those observed for drycleaning alone. The 14-ounce fabric was found to decrease significantly in conductance after wear period III, while no significant change was found for the 12-ounce fabric. Although numerical changes in conductance were observed for the 16-ounce serge after wear, they were not significant. However, these changes indicate the same general trends observed for the other two serges, ie, a decrease in conductance with drycleaning alone and a smaller decrease due to wear plus drycleaning. None of the worn fabrics was found to differ significantly in conductance from those that had been drycleaned only.

Values for conductivity per unit thickness of the serges showed no significant differences as in the case of the flannels. Because the serges were of almost identical construction they might have been expected to have nearly the same conductivity per unit thickness. Wear and/or drycleaning, however, appears to have caused decreases in conductivity per unit thickness of all three weights of serges when compared with values for the new fabrics.

The 16-ounce serge fabric was significantly thicker than the 12-ounce fabric, both when new and after wear and/or drycleaning. The 14-ounce serge, on the other hand, did not differ significantly in thickness from either the 12- or 16-ounce fabrics, although the three weights of serges did increase numerically in thickness with increasing weight. After five drycleanings the three fabrics all increased significantly in thickness; however, further changes due to additional drycleanings were not significant. After five cleanings these 12-, 14-, and 16-ounce serges were 10, 11, and 21 percent, respectively, thicker than the new fabrics. While drycleaning alone resulted in increased thickness of the fabrics, the final result of wear plus drycleaning was a decrease in thickness. After wear period I all three serges were significantly thicker than the new fabrics, but by the end of wear period III these materials were significantly thinner than the new fabrics. In addition, the worn fabrics were thinner than the fabrics that had been drycleaned only.

Generally, it may be said that drycleaning alone increased the thickness and decreased the conductivity of all three materials. While these fabrics appeared to have approximately the same thickness after wear plus drycleaning as when new, a gradual decrease in thickness values with increasing amounts of wear was observed, and at the same time their conductance was lower after wear than when new.

The changes in conductance of the serges may be explained in part by concommitant changes in thickness. However, the correlation coefficient in this case is considerably lower than that found for the flannel fabrics (—0.55 versus —0.98). While the serges were found to differ in thickness, evidently these differences were not great enough to cause significant differences in conductivity.

COMPARISON OF FLANNELS WITH SERGES———The reaction of the serges to wear and/or drycleaning was somewhat different from that of the flannels. Drycleaning caused a greater decrease in conductivity for the serges than for the flannels, even if the substantial increase in conductance for the flannels after ten drycleanings is disregarded. This decrease in conductivity may be attributed to an increase in thickness and the amount of air per unit area of fabric which could be due to 1) shrinkage of the fabric with a resultant increase in thickness, and 2), a fluffing up of the fabric during pressing. Wear and/or drycleaning resulted in an increase in thickness for all serges and flannels, with the exception of those flannels which had been drycleaned ten times. However, the increase in thickness for the serges was more consistent than for the flannels, and appears to explain the greater decrease in conductivity observed for the serges. Flannel fabrics are so constructed that they may be compressed or fluffed up easily during pressing, and therefore greater variations in thickness for these materials may be expected to result from drycleaning.

In general the conductivity of both flannels and serges was greater after wear than after drycleaning alone. At the same time both types of fabric decreased in thickness, decreases for the flannels being greater than those for the serges and, consequently, increases in conductivity tended to be greater. Such changes due to wear were not as marked for the serges as for the flannels, since serge is a more durable fabric and offers greater resistance to the degrading effects of wear. Therefore, the serge fabrics were better able to maintain their original ability to prevent the loss of heat from the body during wear than were the flannels.

SUMMARY

The thermal conductivity of three weights of serge (worsteds) and five flannels (woolens) has been studied, the flannels varying in composition from all new to all reused wool. Measurements were made on the fabrics when new, after drycleaning, and after wear and drycleaning.

No significant differences have been found among the conductivity values for the flannel fabrics containing varying amounts of new wool, either when new or after wear and/or drycleaning. Drycleaning alone tended to decrease the conductivity of these materials, while wear plus drycleaning caused an increase in conductivity. The observed changes in conductivity after wear and/or drycleaning were closely associated with changes in thickness.

The three weights of serge were not found to differ significantly in conductance, one from the other, either when new or after wear and/or drycleaning. Drycleaning resulted in a decrease in conductance for two of these serges. After wear and drycleaning the conductance values for these two materials were still smaller than those for the new fabrics, although an increase over values for drycleaning alone was observed. Wear resulted in an increase in conductance for both the flannels and serges, the increase being greatest in the case of the flannels. Increases in conductance represent decreases in serviceability so far as protection against cold is concerned.

LITERATURE CITED

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• PATENT DIGEST •

PAUL WENGRAF

STIFF NYLON FINISH——— Polyacrylic Acid Combined with Polyalcohols G2,01

USPat 2,692,182 (Rohm & Haas——Nuessle, Crawford)

The regular starch or gum finishes used on linen or cotton have no stiffening effect on nylon, nor are resin finishes generally satisfactory for giving a durable, papery or crisp hand on this material, as stated in the preamble to this patent. Polymethacrylic or polyacrylic acids have been used for producing *removable* nylon sizes; they can be scoured out even after a heat treatment at unusually high temperatures, such as 425-450°F.

It has been found that polyacrylic acids, when combined with polyalcohols, impart a durable finish to nylon by a process of drying, heating to elevated temperatures and subsequently washing with a mildly alkaline neutralizing solution.

Polyacrylic acids may be used in a wide range. A characteristic viscosity (defining experimentally the preferred degree of polymerization) is given as 2-12 centistokes of a 5% polyacrylic acid solution at 100°F. Polyalcohols to be used are, among others, glycols, glycerine, sorbitol, pentaerythritol and so on; generally, they should not contain more than 6 C. The proportion of polyacrylic acids to polyalcohols may vary from 10 : 1 to 10 : 10 (preferable between 10 : 2 and 10 : 5). The mixed components are applied by padding or similar operations. The material is then dried and heated to 300-450°F. Examples of required curing times: at 300°F, 30-60 min; at 375°F, 2 min; at 425°F, about 10 seconds. After the curing treatment, the nylon fabric is washed in dilute alkaline solutions and dried. The finishing effect reportedly resists a laundering soap operation at 120-160°F.

It is interesting to note that the shade appears even darker than before, probably due to increased translucence. The finish may also serve simultaneously as a mordant for basic and several acetate dyes.

Example: a sheer nylon fabric is passed through a bath containing 5% polyacrylic acid (viscosity of a 5% solution at 100°F measured at 12 centistokes) plus a 4% sorbitol solution. A durable crisp organdie finish results after drying and curing are carried out at 400°F for 45 seconds.

Among the references cited by the Patent Office:

U S Pat 2,253,146 (Du Pont/1941): sizing nylon or other synthetic yarns with polymethacrylic acid or copolymers thereof with acrylic acid, styrene and the like.

U S Pat 2,238,694 (Du Pont/1941): coating polymeric synthetic fibers, particularly nylon, with a solid polymeric material that is not capable of being elongated by cold drawing (eg, polymeric methyl methacrylates) to obtain novel surface effects.

FLAMEPROOFING——— Titanium Chloride Acylates in Dilute Solutions G2,03

USPat 2,691,594 (National Lead Co——Wadington)

The current patent, copending with U S Pat 2,658,800 [cf *Am Dyestuff Reptr 43*, 345 (1954)], states that relatively highly concentrated titanium-acylate solutions, containing from 40 to 150 g Ti per liter are not stable upon dilution below 40 g/l. The titanium compound under these conditions hydrolyzes to a white precipitate and renders the solution unusable.

It is desirable in many cases, however, to prepare solutions of lower concentrations, especially when light-weight materials have to be treated. A dilute solution of increased stability, of a lesser salt content, and reduced viscosity is obtained according to the present method by combining aqueous hydrochloric acid with a titanium-chloride-acylate, wherein the organic acid component consists of formic, acetic or propionic acids. The total amount of chlorine present in the composition is between 90-200 g/l. A solution containing 90 g Cl is said to be stable over "at least moderate periods of time", while higher amounts of Cl (up to 120 g and even higher) increase the stability proportionally. It is not advisable to increase the concentration above 200 g/l by reason of tenderizing effects on most textile materials.

The acylate (formate, etc) content is limited to 1-3 mols for each mol of Ti. A content of antimony compounds (antimony trichloride) is advocated to improve flame resistance and to prevent afterglow. A beneficial effect can be expected when at least 1.7 p antimony for one p Ti is applied.

Flameproofing solutions of titanium chloride acetate, containing 30 g Ti, 167 g chlorine, 71 g acetate and 55 g antimony per liter (Ex = III) or 35 g Ti, 107 g chlorine and 82 g acetate per liter (Ex = IV) were tested in applications on cotton cloth. Favorable results are reported in a comparative table.

Reference cited by the Patent Office:

U S Pat 2,570,566 (Du Pont/1951) refers to flameproofing compositions of relatively low concentration containing titanium and antimony in inorganic acids, especially in hydrochloric acid [cf *Am Dyestuff Reptr 41*, 87 (1952)].

SLIPPROOFING WITH DILUTE COLLOIDAL SILICA SOLUTIONS———Cationic Pretreatment G,1

USPat 2,693,427 (Monsanto Chem Co——Kingsford)

The inventor states that colloidal silica has been advocated in the prior art as a slipproofing agent. Relatively high concentrations have been applied heretofore for this purpose.

The object of the present invention is to use instead *dilute* colloidal silica solutions, which exhaust on the textiles or other nontextile materials. The problem reportedly has been solved by a preparation with a cation-active material, preferably cetyl dimethyl benzyl ammonium chloride; some other quaternary bases are also enumerated in the specification.

Silica sols to be used in this process have been described in several U S Patents. Among them, the method protected by U S Pat 2,375,738 (Monsanto Chem Co—White/1945) has been applied in Example I of the current patent, indicating approximately the same conditions as those outlined in the older White patent: sodium silicate is poured into sulfuric acid, the mixture sets to a gel that is washed and then covered with dilute NaOH solution, and it is finally steam treated under pressure.

Textiles are first immersed for 30-60 min in a dilute solution of a cationic surfactant at 70-100°C, preferably rinsed and then aftertreated while still wet with a dilute collodial solution (0.01-0.2% concentration) for 30-60 min at elevated temperatures. An addition of salts, such as sodium chloride, sodium sulfate, aluminum formate or aluminum acetate, was found to improve the slip resistance and fixation of the silica.

Example: a white wool flannel is treated on the jig for 45 min at 80°C in an aqueous bath containing 0.5% cetyl dimethyl benzyl ammonium chloride. The well-rinsed material is further treated in

wet state with a dilute colloidal silica solution (concentration 0.125% SiO_2 content) at 90°C, the pH being adjusted to about 7. The finished material exhibits high slip resistance as does a sample of cotton fabric treated the same way. Wool exhausts the bath to 32%, cotton to 17%.

Among the references cited by the Patent Office:

U S Pat 2,343,095 (Du Pont/1944): rendering a vinyl compound substantive to textiles by dispersing it in a cationactive medium.

U S Pat 2,421,363 (U S Rubber/1947): depositing of rubber from an aqueous suspension on a fabric and rinsing the thus-treated material before drying in a solution of a long-chain-containing quaternary compound.

U S Pat 2,443,512 (Monsanto Chem Co/1948): making unspun textile fibers slipproof by a treatment with a colloidal aqueous solution of silica obtained from a silica gel [cf *Am Dyestuff Reptr* 38, 107 (1949)].

U S Pat 2,527,329 (Monsanto Chem Co/1950): making textile fabrics slipproof by applying a silica sol to the outer surface of the fabric and heating thereafter to 200°F or more.

Brit Pat 483,496 (Rubber Processes Res Assoc - Wool Ind Res Assoc/1938): depositing of rubber from a dispersion on wool that has been pretreated with a quaternary compound, eg, cetyl pyridinium bromide.

ACID VAT DYEING OF ACRYLIC FIBERS———Heat Aftertreatment C,4,07

USPat 2,695,832 (General Aniline——Mautner)

Alkaline vats of the standard type are unsuitable for dyeing fibers of acrylic co- or homopolymers (Orlon, Chemstrand), as only weak dyeings are obtained. Progress has been noted in the use of alkaline indigold vats at 270-275°F under pressure, but according to the preamble to the current patent this method is claimed to be uneconomical.

Very good effects in dyeing with *all kinds of vat dyes* on acrylic fibers containing at least 85% acrylonitrile have been observed when the vat dye is applied in the form of an acid vat solution, and the dried material is aftertreated for 10 sec - 2 min at temperatures between 300-400°F. Heating can be carried out in any known way, for instance, by radiation (infrared rays), by passing the fabric over a heated surface, through a hot gaseous atmosphere, through a molten metal bath, etc.

Example: Indanthrene Black BBN Double Paste (*CI* 1102) is vatted with sodium hydroxide and sodium hydrosulfite in the presence of an acid-stable dispersant. The resulting alkaline vat is converted into the acid vat by adding a controlled amount of dilute acetic acid while heating to 150-160°F. This liquid is padded on 100% polyacrylonitrile filament. After the stock is dried and heat set in an oven for one minute at 350°F, the dyeing is found to be fast to light, washing and crocking.

Among the references cited by the Patent Office:

Am Dyestuff Reptr of Jan 22, 1951, P51-4 (Meunier-Du Pont) deals with Orlon dyeing. On page 52, reference is made to the dyeing of Orlon with vat acids by padding, drying and reoxidizing. Heat aftertreatment is not mentioned.

U S Pat 1,900,172 (Celanese Corp of Am/1933): dyeing of cellulose acetate with free leucovats from acid or neutral baths (thus, principally, with vat acids).

U S Pat 2,080,254 (Celanese Corp of Am/1937): vat dyeing of cellulose ester (acetate) fibers by padding the material in a vat solution, drying and heating to 150-180°, preferably to 150-160°C.

SHRINKPROOFING OF WOOL ———Water-soluble Derivatives of Nylon-type Compounds A,2,04

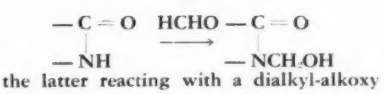
USPat 2,696,448 (Montclair Res——Ellis Foster——Hammer, Rust)

It is contended, in the introduction to the present patent, that the shrinkproofing of wool by customary methods does not give completely satisfactory results: the normal hand is generally impaired, sometimes the fiber strength is diminished, and/or the effect does not prove to be durable.

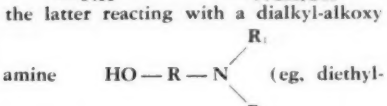
According to the present method, one can produce greatly improved shrinkproofing effects on wool by applying water-soluble nylon (polyamide derivatives), and following with an insolubilizing treatment (preferably heating). Some of the nylon derivatives have to be cured at 130°C or at higher temperature, while others are insolubilized by simple drying, usually below 100°C.

The specific nylon derivatives to be used in this method are water-soluble salts of dialkyl-substituted-N-alkoxy methyl polyamides with carboxylic (fatty) acids. The alkyls linked to N should have less than 6 C atoms. Quite generally the nylon substance dissolved in formic acid is reacted with paraformaldehyde and an alkanolamine. Formaldehyde with the NH group of the nylon unit forms a methylol compound, which is further transformed into another amino-type compound that becomes soluble in the form of its aliphatic acid (formic acid) salt.

The scheme of this reaction is, therefore, nylon unit plus formaldehyde forming the methylol compound . . .

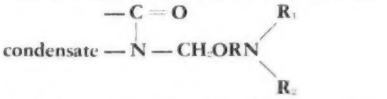


the latter reacting with a dialkyl-alkoxy

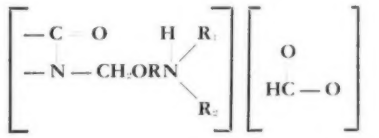


amine (eg, diethyl-

amino ethanol) to form the acid-soluble



condensate that gives with formic acid the product



A series of examples refers to the production of nylon derivatives of this kind, starting with condensates of the nylon class, such as polyamino-ε-amino caproic acid, etc, with paraformaldehyde and the hydroxy-alkyl-substituted amine plus formic acid, and following with precipitation of the water-soluble nylon derivative with acetone. Another series of examples refers to the application of these products, eg, the polyhexamethylene adipamide diethylamino ethanol derivatives. Wool is impregnated with a 3% aqueous solution of these substances (in the form of their salts), dried and cured for 15 min at 130°C. A shrinkproofed fabric (9.4% total shrinkage against 41-44% for the nontreated material) results.

Among the references cited by the Patent Office:

U S Pat 2,412,993 (Du Pont/1946): preparing N-alkoxy methyl polyamides by heating formaldehyde and aliphatic alcohols with a solution of a linear polycarbon amide in a lower organic acid.

U S Pat 2,430,907 (Du Pont/1947): protecting the synthesis of water-soluble N-substituted linear polyamides, eg, by reacting the nylon polyamide dissolved in concentrated formic acid with paraformaldehyde and glycolic acid or an ester thereof.

U S Pat 2,526,637 (Du Pont/1950): shrinkproofing of wool with synthetic basic *aminopolymers* (of high molecular weight) and formaldehyde, the polymers being obtained, for instance, by reductive amination of an ethylene—carbon monoxide copolymer (in contrast to the nylon-type superpolyamides) [cf *Am Dyestuff Reptr* 40, 198 (1951)].

Reference may also be made to U S Pat 2,689,193 (Commonwealth Scientific and Ind Res Organiz), which covers a method that may be used for shrinkproofing of nylon derivatives, especially methylol compounds in alcoholic solutions thereafter insolubilized by mineral acids [cf *Am Dyestuff Reptr* 44, 669 (1955)].

ABSTRACTS

Characteristics of Wash and Wear Cottons

Lippert, A L, *Textile Inds* 119, 109-12, December, 1955.

The term "minimum-care cottons" is preferred by the author to "wash and wear cottons," because there are other factors that the consumer may require (eg, fastness to ironing) which are beyond the narrow definition of "wash and wear."

The properties that are desirable in minimum-care cottons may be divided into two general groups: 1) tensile and tear strength, abrasion resistance, absorbency, comfort, resistance to laundering, etc; 2) dimensional stability, resistance to deformation, crease recovery, and ease of drying.

The author discusses the effect of resin concentration (in the anticrease process) on the loss in tensile and tear strength; the desirability or otherwise of water-repellency in minimum-care cottons; and the importance of freedom from chlorine retention and of the dimensional stability of the fabric.

He points out two distinct dangers that may impair or destroy the public acceptance of minimum-care cottons: needlessly exaggerated claims of performance, which may lead the public to consider them only "another purely advertising stunt," and the sale, under the designation of "minimum care" of fabrics that are obviously unsatisfactory.—WHC.

White Discharge Printing: How to Get Better Results

Anon (Technicus), *Modern Textiles* 36, 48, 50, 66, October, 1955.

The aim of the author is "to offer some practical information and useful hints on various phases of the printing process for production of white discharge patterns on dyed grounds."

He emphasizes the importance of selecting the proper thickenings, and compares the properties of gum tragacanth and the "starchy" products (eg, British gum). Lubricants also play an important part; for example, highly sulfonated oils, miscible with aqueous print pastes or used as emulsifiers for mineral oils. Glycerin also acts as a lubricant.

The depth of the engraving is important; it should be deeper than for direct prints, in order to obtain good penetration. The depth will vary, of course, according to the type of cloth being printed.

The author discusses some of the difficulties encountered in engraving the print rolls, and stresses the importance of polishing the surface of the rolls after each printing. Copper rolls to be chromium plated should be highly polished before the chromium is applied.

The two main types of steaming chambers, festoon and rapid agers, are described. The author states that the festoon type is becoming more popular, due to its greater flexibility of application, especially for screen prints.

The question of the best steam conditions is discussed, particularly the relative merits of superheated and saturated or moist steam. Acid steam is recommended for the fixation of pigments with resin binders.

All discharge prints should be washed as soon as possible after steaming, to avoid marking-off. Continuous slack washing with cold water is recommended—WHC.

Terylene Fiber and the Woolen Industry

Booth, J, *Can Textile J* 72, 41-8, December 2, 1955.

The author first describes the production of Terylene (equivalent to Dacron) from dimethyl terephthalate and ethylene glycol, and furnishes much data on its physical and chemical properties. He mentions particularly the ability of Terylene to form permanant creases, its high dimensional stability, its resistance to sunlight which he says is equal to the best of the natural fibers and definitely better than some of the other synthetics, its warmth of handle, and its high abrasion resistance.

Most of the paper is devoted to the blending of Terylene with wool and the dyeing of these blends. Because of the high crystalline nature of Terylene, dyes do not penetrate rapidly into the fiber, but the rate of diffusion can be accelerated by dyeing close to the boil. Only two classes of dyes are satisfactory for Terylene: the disperse acetate dyes, and certain azoic combinations which are applied by a special technique. For medium and dark shades with the disperse dyes a carrier such as ortho-phenylphenol is added to advantage.

Dyeing of Terylene-wool blends requires careful control. Dyes must be selected for the Terylene which have minimum staining effect on the wool, and all loose dye must be removed by thorough scouring. By proper selection of dyes it is possible to dye the wool one shade and the Terylene a different shade, or leave the Terylene undyed. There is considerable advantage, however, in dyeing the Terylene by itself before blending with the wool.

The author also discusses the finishing of Terylene and blends with wool, including half-hose, and mentions some of the commercial applications of the woven fabrics.—WHC.

Use of Metallic Monofilaments and Yarns

(From *Textile Organon*)
Can Textile J 72, 52-3, December 2, 1955.

The use of metallic monofilaments and yarns in cloth goes back many centuries. But the many new developments in this product over the past few years are worthy of review.

Contrasted with yarns made of the precious metals, the new metallic yarns are non-tarnishable, non-toxic, relatively inexpensive, pliable and easily used in weaving and knitting.

The great bulk of the metallic yarns made today employ an aluminum foil. The basic metallic monofilament is made by first laminating or bonding a wide web of cellulose acetate butyrate film to both sides of the aluminum foil; cellophane is sometimes used instead of the acetate butyrate film. The color is usually put into the bonding material, and this determines the color of the final monofilament product; a clear, transparent adhesive or bonding material produces a silver or aluminum color, of course. Also, different colors may be put in the upper and lower bonding materials to produce high-style, iridescent effects, or the laminated film itself maye be printed or dyed. Finally, the laminate is slit to the desired width to make the rectangular-section monofilaments.

Most of the acetate butyrate monofilaments are plied with one or more ends of another yarn to make a true "supported metallic yarn;" among the latter yarns used are rayon, acetate, nylon, silk, linen, cotton, wool, etc. The resulting supported yarns may then be used on conventional power looms or knitting machines to produce any kind of fabric desired.

The author also describes Du Pont's Mylar polyester film, which may be used in place of the acetate butyrate film. Mylar is chemically the same as Dacron.

The various end uses of the new metallic yarns are discussed by the author, who gives the names of the five largest producers.—WHC.

Orlon and Other Acrylic Fibers

Nagar, P S, *Man-Made Textiles* 31, 60, May, 1955.

Orlon fiber is an addition polymer of acrylonitrile (vinyl cyanide) which is made by reacting ethylene oxide with hydrocyanic acid in the presence of a catalyst.

Its tensile strength is 65,000 to 74,000 psi. The dry strength is 4-5 grams per denier, and being water-resistant its wet strength is nearly the same. The fiber has similar tenacity, elongation and elastic recovery to natural silk. It has low water absorption, high flex life, and high stretch resistance, but its resistance to abrasion is inferior to that of nylon. It has outstanding resistance to sunlight, outdoor weathering, and acid gases. When fabrics made from Orlon are ironed, sticking begins at 180-200°C.

Orlon has a remarkable resistance to degradation by heat. After 42 days at 130°C it retains 71 percent of its original strength, and at —50°C there is an increase in strength by 40 percent.

Orlon's resistance to chemicals is fair but not so good as that of nylon. It has moderate resistance to acids but only poor resistance to alkalis. It is resistant to molds, mildew and insects. It is warm to the touch, drapes well, and does not crease easily. The handle of the staple fiber is more wool-like than other synthetic fibers. It has great ability to withstand rough handling.

Because of the low water absorption of Orlon and the lack of polar groups, even the acetate rayon dyes are not easily absorbed. For these dyes the author recommends dyeing under pressure at 140-150°C and the addition of "carriers" to obtain full shades. Direct and acid dyes may be applied by the cuprous-ion process. (The author was apparently unaware of the fact that basic dyes will also dye Orlon).

Owing to its outstanding resistance to ultraviolet light and outdoor exposure and its high strength, Orlon may be used for awnings, sail cloth, tents, ropes, car tops, nets, outdoor furnishings, window curtains and shades. It is also suitable for shirts and suitings, sportswear, knitwear, and filter fabrics.—WHC.

The Dyeing of Terylene Polyester Fiber with Disperse Dyes Above 100°C

Fern, A S, *J Soc Dyers Colourists* 71, 502-12, September, 1955.

The stability, dyeing, and fastness properties of a range of disperse dyes have been studied on Terylene polyester fiber at temperatures up to 120°C under laboratory conditions. The following conclusions are recorded:

1) Terylene fiber can be treated for 2 hours at temperatures up to 160°C in the pH range 2.8-7.0 without a reduction in its toughness factor. If the dyebath is allowed to become alkaline, degradation may set in rapidly at temperatures above 100°C.

2) The optical absorption curves of most disperse dyes are unaffected by heating at 130°C for 2 hours. Even where the optical absorption characteristics of the dye change appreciably as a result of this treatment, ie, with the three blue dyes examined, there is still no apparent change in the color and fastness properties of the derived dyeings. Dye instability should not, therefore, present a problem in bulk high-temperature dyeing.

3) With existing Duranol and Dispersol dyes, no advantage is to be gained by dyeing Terylene at temperatures much above 120°C. Although superior results may be obtained with very slow-dyeing dyes at 130°C, the reduction in exhaustion of the other dyes means that this higher temperature is relatively uneconomical. At 120°C the times of half-dyeing of most disperse dyes on Terylene are comparable with those of the same dyes on acetate at 85°C.

4) The large majority of dyes possess moderate to good exhaustion in 60 minutes at 120°C, and can be used economically for even the heaviest of dyeings. With the exception of Dispersol Fast Yellow A, the building-up properties of disperse dyes on Terylene at 120°C are much superior to those at 100°C in presence of *o*-phenylphenol as assistant. This means that colors can be obtained at 120°C which are unobtainable, as far as depth is concerned, at 100°C.

5) The disperse dyes examined vary in their sensitivity at 120°C to assistants such as *o*-phenylphenol, and the influence of this agent on building-up properties does not seem connected with the rate of diffusion of the dye. The indiscriminate use of dyeing assistants at temperatures above 100°C cannot be justified at the present time.

6) Certain dyes are very sensitive to alkaline dyebath conditions. No advantage is gained by adding acid deliberately to the dyebath, and dyeing with disperse dyes should therefore be carried out under substantially neutral conditions. Care must be taken to neutralize any compounds in the water which may become alkaline on prolonged treatment at 120°C.

7) The leveling properties of many dyes are considerably improved at 120°C, although the violet and blue members of the range have poor leveling properties even at this temperature.

8) There is no evidence of dye interference on the fiber in binary and ternary mixtures of four widely used disperse dyes. Incompatibility difficulties should not exist when dyeing Terylene at 120°C.

9) If Terylene is dyed at 120°C, a high degree of exhaustion is obtained from most disperse dyes in a practical dyeing time (1 hour or less), expensive carriers are unnecessary, and in many cases clearing treatments after dyeing can be eliminated. High-temperature techniques should therefore be preferred to dyeing at 100°C with a carrier, provided that other economic factors permit, and that suitable equipment for processing the fiber, yarn or fabric is available.

There are 22 references to the literature.—WHC.

Bleaching Jute with Hydrogen Peroxide

Chatterjee, H, and Pal, K B, *J Soc Dyers Colourists* 71, 525-30, September, 1955.

A single-bath process of bleaching jute with hydrogen peroxide is described, with particular reference to loss of weight, lignin, and breaking strength, as well as the color of the bleached material and the composition of the residual lignin. The influence of variables (eg, reaction temperature, time, bleach concentration, liquor ratio, pH, and bleachability with peroxide compared with chlorite) has been studied.

Jute may be bleached white with peroxide with only a small loss of lignin, and the composition of its residual lignin remains more or less unchanged. It is believed that the point of attack by peroxide is a phenolic hydroxyl group, and that the color change is mainly due to an unknown structural modification of native lignin. A one-volume bath of peroxide containing a stabilizer under alkaline conditions, and a 1 percent solution of acidified chlorite at a liquor ratio of 10:1 and a temperature of 60-70°C, are suitable for bleaching jute. In both cases over 70 percent of the yarn strength can be maintained in the fully wet condition. The tendency of the bleached material to become yellow on storage is much less pronounced with peroxide than with hypochlorite or chlorite. The quality of such a yarn is unimpaired by long storage.

There are 26 references to the literature.—WHC.

The Future of Wool

Speakman, J B, *Textile Mercury & Argus* 133, 412, 414, 417 (1955).

At the end of the first world war the textile industry might have been described as one in which imperfectly understood processes were being applied to fibers of unknown composition. Then came a transformation, beginning with the formation of textile research associa-

tions in 1918 and the simultaneous initiation of scientific research on textile fibers, machinery and processes in the universities.

During the succeeding period the main features of the constitution and structure of most natural fibers have been elucidated, numerous new fibers have been produced, the precise functions of different processes have been established, new processes based on exact knowledge of the constitution of the fibers have been evolved, existing machinery has been the subject of close scrutiny by the mathematician, physicist and engineer, and new machinery has been invented. In short, the textile industry has undergone a scientific revolution.

The most dramatic feature of this age of fiber science is, of course, the rise and development of man-made fibers. As regards the future, it should be noted that the high price of wool has spurred on the attempt to find effective substitutes.

As to the claim frequently made that wool and man-made fibers are complementary and not competitive, the author says that in one sense they are, of course, complementary, as for example, when wool and nylon staple fiber are blended together to give half-hose in which the warmth and kindly feel of wool are combined with the great wear-resistance of nylon; or when wool and Terylene staple fiber are mixed to give fabrics which are capable of taking permanent pleats; or when wool is blended with viscose staple fiber to provide the consumer with cheaper fabrics; or when wool and man-made fibers are used in conjunction with one another to give cross-dyed and other novel effects.

But it is only when there is an expanding demand for textiles that the wool grower can view with equanimity the blending of man-made fibers with wool. Under other circumstances, such blending must diminish the demand for wool, especially if it results in fabrics of greater durability.

Discussing the characteristics of the wool fiber, the author points out that such qualities as fineness, length and crimp are capable of exact measurement, but that there are other qualities, expressed by such indefinite terms as "character" and "substance" which cannot be so measured and make it impossible for the user of wool to give adequate guidance to the wool grower in his attempt to produce wool suited to particular needs.

The author discusses breeding control, research on cross-linking, and the development of unshrinkable finishes. He notes, however, a lack of co-operation between the research worker and the industrialist in the wool textile industry. —WHC.

Stabilization of Structures Made from Polyester Fibers

Marvin, D N and Carlene, P W, *Textile Mfr* 81, 492-4, September, 1955.

Terylene filament yarn as supplied to the textile industry contains approximately 1 tpi twist, with the result that it is common practice for processors to insert additional twist to aid processing and to achieve the requisite properties in knitted and woven fabrics, and other end-use products made from it. As with other fibers, a level of twist is reached at which it becomes necessary to reduce the liveliness of the yarn to facilitate processing.

Yarns in the denier range 50 to 250 and containing up to 50 tpi may be effectively twist-set by steaming at 110°C for 20 minutes. It is essential that yarn to be twist-set should be wound on collapsible tubes to ensure uniform relaxation of the yarn throughout the package and the production of a twist-set yarn possessing homogeneous physical properties and uniform dyeing properties from outside to inside of the package.

Steaming is also used for relaxing yarn which is intended for package dyeing at super-atmospheric pressures, in which temperatures of 115-120°C are employed. Such temperatures cause Terylene filament yarn to shrink, forming a hard package with consequent dye channeling and dye variability. Relaxation of the yarn on collapsible paper tubes at approximately 130°C with subsequent rewinding to form the package for dyeing eliminates the problems associated with dyeing at 115-120°C. Furthermore, dyed yarns processed by this technique yield woven fabrics which are dimensionally stable at temperatures up to 180°C dry.

Terylene yarn in an unrestricted state shrinks in boiling water about 7 percent. The higher the temperature, the higher the resultant shrinkage. It is necessary to heat-set the material to make it dimensionally stable to laundering and ironing. It has been demonstrated that a Terylene fabric will be dimensionally stable if it is heat-set at a temperature 30-40°C higher than that at which it is required to be stable.

The author gives instructions for heat-setting Terylene fabrics on a hot-air pin tenter at 220-230°C. He states that high-pressure steaming will also stabilize these fabrics but causes degradation of the fiber by hydrolysis.

Terylene staple, during manufacture, is given a crimp which is heat-set at high temperature in order to stabilize it to forces applied during carding, combing and spinning. Because of this heat treatment, the staple shrinks less than 1 percent in boiling water and only about 4-5 percent at 200°C. However, the carding, spinning, etc, introduce mechanical strains, and the spun yarn will shrink 6-9 percent in boiling water. Knitted fabrics shrink more than woven fabrics.

The author discusses at considerable length the stabilization of Terylene half-hose and jersey fabrics. He recommends a combination of heat and moisture at about 140°C to set half-hose. Shrinkage control before finishing is also discussed. —WHC.

BOOK REVIEW

HANDBOOK OF TEXTILE FIBERS

Milton Harris, Editor. Published by Harris Research Laboratories, Inc. 1246 Taylor Street, NW, Washington 11, D C. October 1954. 356 pages 8¼ by 11 inches, approximately 400 tables, 100 graphs, 140 photomicrographs and X-ray diagrams, 1800 definitions; $12.50.

This is a book designed to fill a long outstanding need on the part of the textile industry in general and textile technicians, technologists, and scientists in particular. It provides, in one convenient volume, a vast amount of technological information pertaining to textile materials. The scope of the book can be appreciated by reference to the titles of the eighteen sections into which the contents are divided: Textile Terms and Definitions, Fiber Types and Sources, Constitution and Structure of Textile Fibers, Chart of Fiber Properties, Physical Properties of Textile Fibers, Chemical Properties of Textile Fibers, Effect of Biological Agents, Identification of Textile Fibers, Yarn Numbering and Count Systems, Chemical and Engineering Tables, Economic and Production Data, List of Textile Periodicals, and Index.

The treatment in each section is very complete, clearly presented through the use of easily read type and a large page size, and quickly found by means of the extensive index. Information is presented through the widespread use of tables, charts, graphs, and photographs. For example, 140 micrographs and X-ray diagrams are reproduced in connection with the chemical constitution and structure

(Concluded on page 211)

Proceedings of the

American Association of Textile Chemists and Colorists

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MARCH 26, 1956

AATCC CALENDAR

COUNCIL

Apr 20 (Benjamin Franklin Hotel, Philadelphia, Pa); June 15; week of Sept 10th (New York, N Y); Nov 16; Jan 18, 1957.

NATIONAL CONVENTIONS

Sept 13-15, 1956 (Waldorf-Astoria, New York) (as part of the Perkin Centennial. Sept 10-15); 1957 (Boston); 1958 (Hotel Conrad Hilton, Chicago); 1959 (Washington, DC)

HUDSON-MOHAWK SECTION

May 18 (Ladies' Nite); June 22 (Annual Outing).

MID-WEST SECTION

May 5 (Plankington Hotel, Milwaukee, Wis); June 16 (Outing—Browns Lake Resort, Burlington, Wis)

NEW YORK SECTION

Apr 27, May 18 (Kohler's Swiss Chalet, Rochelle Park, N J).

NIAGARA FRONTIER SECTION

Apr 27 (U S).

NORTHERN NEW ENGLAND SECTION

Apr 27 (Lowell Technological Institute, Lowell, Mass); Sept 28 (Annual Outing—Wachusett Country Club, West Boylston, Mass); Oct 19 (Science Park, Boston, Mass); Dec 1 (Annual Meeting—Hotel Vendome, Boston)

PHILADELPHIA SECTION

Apr 20 (Ladies' Night — Benjamin Franklin Hotel, Philadelphia); May 25 (Annual Outing — Huntingdon Valley Country Club, Abingdon, Pa); Sept 28 (Abraham Lincoln Hotel, Reading, Pa); Nov 2 (John Bartram Hotel, Philadelphia, Pa); Dec 7 (Kugler's Restaurant, Philadelphia, Pa)

PIEDMONT SECTION

Apr 7 (Sir Walter Raleigh Hotel, Raleigh, N C); June 8-9 (Outing—Mayview Manor, Blowing Rock, N C); Oct 6 (Annual Meeting—Hotel Charlotte, Charlotte, N C)

RHODE ISLAND SECTION

Apr 26 (Student Night, Rhode Island School of Design); May 25 (Ladies' Night, Sheraton-Biltmore Hotel); June 15 (Annual Outing, Pawtucket Country Club); Oct 18 (Johnson's Hummocks Grille); Dec 6 (Annual Meeting, Johnson's Hummocks Grille)

SOUTH CENTRAL SECTION

Apr 28 (Hotel Patten, Chattanooga, Tenn); June 22-23 (Lookout Mountain Hotel); Dec 1 (Hotel Patten)

SOUTHEASTERN SECTION

Apr 14 (Lindale, Ga); June 8-9 (Outing—Radium Springs, Albany, Ga); Sept 22 (Columbus, Ga); Dec 8 (Atlanta, Ga).

WESTERN NEW ENGLAND SECTION

May 11 (Ladies' Night—Waverly Inn, Cheshire, Conn); June 15 (Outing); Oct 15 (Annual Meeting—Hartford, Conn); Nov 16 (Rapp's Restaurant, Shelton, Conn)

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

56-2

Education: BS, Chemistry & Dyeing with honors.
Experience: Research chemist.
Age: 27; married; references; presently staff sergeant, radio, U S Air Force, to be discharged in May; laboratory work in dye application desired.

3-12, 3-26

56-3

Education: Part of textile institute course in chemistry & dyeing.
Experience: Chemist & dyer for one worsted manufacturer, thirty years.
Age: 48; married; references; position in dyestuff laboratory near Philadelphia desired.

3-26, 4-9

MEMBERSHIP APPLICATIONS

February 10, 1956

SENIOR

John C Addabbo—Dyer, Acme Knit Goods Processing, Inc, Brooklyn, N Y. Sponsor: E C Jakob.

John M Berry—Supt, dyeing & finishing, Milco Undergarment Co, Bloomsburg, Pa. Sponsors: T R Scanlan, Jr, E Burrell.

William G Filmyer—Salesman, Pioneer Salt Co, Philadelphia, Pa. Sponsors: B A Casey—AS, G J Littlewood.

Maurice C Furlong—President, Continental Dye Works, Philadelphia, Pa. Sponsors: T R Scanlan, Jr, E J Smith.

Stephen J Hawes—Mgr, Johnson Chemical Co, Charlotte, N C. Sponsors: W E Rixon, W C Caldwell.

James F Hughes—Textile colorist, Toms River-Cincinnati Chem Co, Toms River, N J. Sponsors: T P Higgins, J A Meier.

John R Kendrick—Project engineer, Toms River-Cincinnati Chem Co, Cincinnati, O. Sponsors: J Crane, J W Ertel.

Robert J LeBrun — Assist supv, grey, bleach, merc, Pontiac Div, Fruit of the Loom, Warwick, R I. Sponsors: B A Heslin, C C Adams.

Abraham A Levin—Supt of finishing, Warren Fabrics Co, Inc, West Warren, Mass. Sponsors: W W Pennock, S Helfand.

Dora A Nevels—Chemist, West Point Mfg Co, Research Div, Shawmut, Ala. Sponsors: R E Hudson, Jr, A Fisher, Jr.

Donald J Ott—Mitin res, entomologist, Res Lab, Geigy Chem Corp, Bayonne, N J. Sponsors: E W Birdsall, F F Myers.

Ottaviano Pelleccione—Dyer & finisher, Riverpoint Lace Wks, West Warwick, R I. Sponsors: E K Bush, H K Goerner.

Aaron Permut—Consulting Chemist, Solitone Labs, Hasbrouck Heights, N J. Sponsors: M Previte, W B Wilson.

John Quinn—Plant supt & colorist, Fastex Print & Dyeing Co, Sterling, Conn. Sponsors: W A Green, D J Eccleston.

Harry F Rhoads, Jr—Salesman & tech demonstrator, E I duPont de Nemours & Co, Inc, Charlotte, N C. Sponsors: H H Field, J V Killheffer.

(Continued on page P206)

1955 National Convention and Mid-West Section——

SOIL-RESISTANT TREATMENT OF FABRICS*

JASON M SALSBURY, T F COOKE, ELLIOT S PIERCE and PHILIP B ROTH

Research Division and Organic Chemicals Division

American Cyanamid Co

Bound Brook, N J

The mechanism of dry soiling is considered and the action of a soil-resistant finish is proposed. A laboratory method for measuring the dry-soiling properties of fabric is described. Methods are given for applying soil-resistant materials in the laboratory and under commercial conditions. The results of laboratory tests are compared with actual wear tests on carpets made of a number of different fibers.

A newly developed soil-resistant finish is described. In small quantities it greatly reduces the soiling properties of fabric. The main advantages of this soil retardant over earlier types are said to be a softer hand and little or no effect on the light fastness of dyes.

INTRODUCTION

THERE is an increasing demand for soil-resistant finishes on today's fabrics. New developments in the rug industry have made the public more aware of the need for retardants and ease of cleaning. Claims by customers of excessive soiling have increased sharply, particularly in the case of nonwool rugs and blends of wool with other fibers. The increasing number of ranch houses with entrances directly into the living room combined with the growing preference for pastel colors have contributed to this serious problem of excessive soiling. As a result, there is a need for finishes that will make fabrics soil less and be easier to clean.

A soil-resistant finish reduces the rate of soiling of a fabric. Its main function appears to be the prevention of firm attachment of soil to the fabric. Thus a fabric treated with a good soil-resistant finish will appear less soiled in use and will be easier to clean than an untreated one. This is dramatically illustrated in Figure 1, which shows treated and untreated carpets after soiling and vacuuming.

Carpets are not the only type of fabric to benefit by the application of a soil-retardant finish. The rate of soiling of other fabrics, such as drapery and upholstery, is reduced by a soil-retardant finish. Surfaces such as wallpaper and painted materials can also be made soil-resistant.

HISTORY

SOIL-RETARDING AGENTS—— Early work towards soil resistance was concerned mostly with clothing. The application of starch by Stout and Schriemeier *(24)* made shirts soil less rapidly by giving the fabric a smoother surface. Carboxymethylcellulose has been used to prevent soil redeposition in the industry *(18)*, but this, of course, is not related to the initial prevention of soiling. Resinous materials have been used to coat fabrics in order to diminish their soiling as Bruckner *(3)*, Zimmer *(29)* and Leonard and Schwartz *(15)* have reported. None of these materials, however, has been useful in combating the long, hard use and soiling to which carpets are subjected. Cogovan and Frederici *(7)* patented the use of colloidal silica as a partial solution to the problem. The application of silica produced a harsh hand and decreased the light fastness of some dyes, but it was one of the first big steps toward retarding the soiling of carpets. The addition of softeners to the silica improved the hand but decreased its soil-resistant effect.

Certain cationic softeners have been used to retard the soiling of viscose carpets. They leave the carpet soft, but are not as effective soil retardants as silica.

A mixture of alumina and silica was then found by Florio and Mersereau *(8)* to be very effective as a soil retardant without the deleterious effects of silica alone. Juvenon Soil Retardant R, hereinafter called Juvenon R, an aqueous inorganic dispersion, is the latest soil retardant developed and is now being used in commercial quantities. It is completely different chemically from previous soil retardants.

Figure 1
The effect of a soil-retardant finish on the soiling of carpets

SOILING

NATURE OF SOIL—— To understand how a soil-resistant finish functions, it is first necessary to examine the known facts about dry soiling. Household soil is a mixture of finely divided minerals and organic matter, as Studer has shown *(25)*. Hair and skin, as well as fiber fragments from clothing and furnishings, are also present, but these are so easily removed compared to the small particles and greases that we can ignore them.

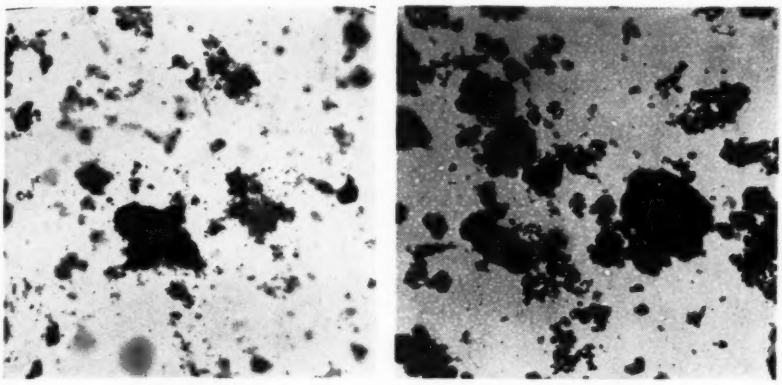
For convenience, the organic oils, greases and tars in dirt are called "oil" and the minerals "solids." Using Studer's *(25)* and Hoyt's *(12)* data, the weight of the solids in vacuum cleanings is calculated to be 7-19 times as much as the weight of the oil, depending on the locality. This ratio is important since Fortess and Kip *(9)* and others *(22, 28)* proved that oils bind dirt strongly in dry soiling.

Particle size distributions of natural and synthetic soils have been determined by Saunders and Lambert *(20)* and others. Floor sweepings and the synthetic test soil used in this work have been examined in greater detail in our laboratory, using the electron microscope and the supercentrifuge. The results agree with those of Saunders and Lambert.

An electron micrograph (Figure 2) of floor sweepings and of our synthetic soil shows a large number of particles below 1 micron. The weight and surface area distribution of these soils is shown in Table I as a function of particle size. These data emphasize the importance in soiling

* Presented by Jason M Salsbury before a Symposium on Dyeing and Finishing, which was held September 24, 1955 in the Viking Room, Haddon Hall Hotel, Atlantic City, N J, and before the Mid-West Section meeting of February 11, 1956 at the Bismarck Hotel, Chicago, Ill.

NOTE: Juvenon is a registered trade-mark of Alexander Smith, Incorporated; Decerosol is a registered trade-mark of American Cyanamid Co.



Natural soil Synthetic soil

Figure 2
Electron micrographs of soil (5,000X)

TABLE I
PARTICLE SIZE DISTRIBUTION OF NATURAL AND SYNTHETIC SOIL

Particle size (Microns)	Natural soil		Synthetic soil	
	Weight	Surface Area	Weight	Surface Area
	(%)	(%)	(%)	(%)
0.1-0.2	13.3	72.9	0.0	0.0
0.2-0.5	0.0	0.0	12.8	48.0
0.5-1.0	3.5	4.0	16.7	26.3
1.0-1.2	0.0	0.0	0.0	0.0
1.2-2.2	11.7	4.5	19.7	15.2
2.2-3.3	66.0	18.1	0.2	0.1
3.3-70	5.5	0.5	45.6	10.3
70-150	0	0	5.0	0.1

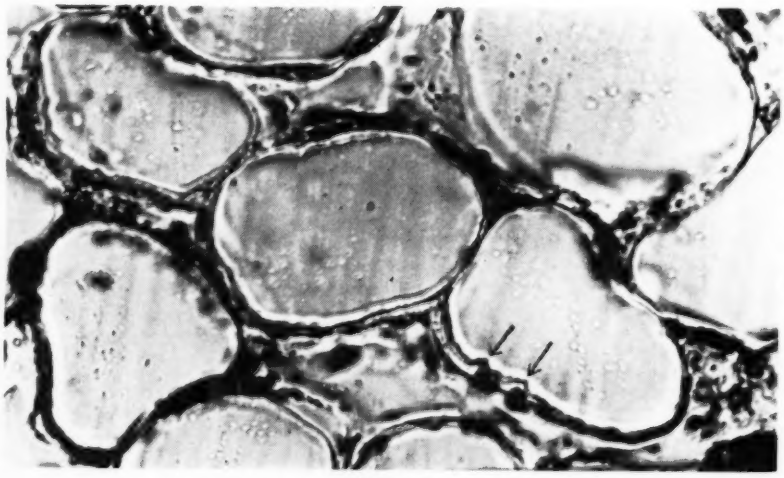


Figure 3
Crevices formed by dirt particles in the surface of a fiber (750X)

by particles of less than 1 micron diameter. The natural dirt has 17% of its weight and 77% of its area in that low range, while the synthetic soil has 30% of its weight and 74% of its area.

The distribution below 1 micron is believed to be very important, and the surface area comparisons are believed to be more significant than weight comparisons. The reasons are, first, the smaller particles are retained more tenaciously than the larger ones by the fibers' micro roughnesses and by van der Waals' forces, which depend on area of contact; second, pigment particles the size of soil particles give more darkening as the size is reduced. For example, the smaller the particle of carbon black, the darker it appears.

The shape of the particle is also important. Soil contains irregular particles, as shown in Figure 2. Irregularly shaped particles are retained to a greater degree than spherical particles since they can work into crevices from which they are not easily removed.

SOILING PROCESS —— The dry soiling process has been logically broken down by Masland *(16)*, Snell et al *(22)* and others *(15)* into contact and retention. In carpets, contact is largely from shoes; airborne dirt is less important because of its relatively low concentration *(19)*. A soil particle from a shoe contacts the fiber and is simultaneously ground in by high pressure and scraping. This type of soiling is much more severe than that with airborne soil, which has time to settle into spaces between fibers *(6)*, away from areas directly in contact with the shoe.

The combination of the motion and pressure of the shoe encountered in the soiling of carpets is important in the lodging of dirt particles in fiber crevices into which they might not otherwise find or fit. Florio and Mersereau *(8)* regard the formation of a crevice by a dirt particle itself as an important part of the impingement process. Fibers with a greater surface hardness will, of course, be more resistant to surface distortion *(8)*. Greater surface elasticity should also cause greater resistance to soiling through recovery of deformation and disappearance of indentation after the shoe pressure is removed. An illustration of crevices formed by dirt particles in an experimental fiber is shown in Figure 3.

The ability of nylon fibers to resist surface pressure and friction, which is related to hardness and elasticity, has been studied by Chapman and Menter *(4)* using reflection electron microscopy. At pressures of 80 kilos/cm^2 or less, damage to the fiber is a deformation of cross-sectional shape from round to indented with little or no tearing. The relatively high pressure created locally when a soil particle is pressed by a shoe against a fiber is thus sufficient, at least with nylon, to cause permanent indentation, in a shape exactly fitting the soil particle.

The effect of electrical charge on impingement has been considered by Snell et al *(22)*. Approximately a third of airborne dirt is uncharged, but two-thirds is charged, mainly negatively *(13)*. Any charge on a surface will attract oppositely charged soil. Uncharged soil may be attracted through an induced charge. Attraction by electrical charge, however, is of minor importance compared with shoe-borne soil, which is brought into intimate and forceful contact with the carpet quite independently of charge.

SOIL RETENTION

The factors involved in soil retention are summarized in Table II.

SOIL SIZE AND SHAPE———Fibers have small irregularities in their surfaces as will be shown later. These irregularities can serve as sites to collect dirt. These sites increase in number as their size decreases; thus, it would be expected that small soil particles, particularly those measuring less than a micron, would be retained tenaciously in greater numbers than larger particles.

FIBER SHAPE AND SMOOTHNESS ———The serrations in acetate fibers serve as sites for the collection of dirt. Figure 4, photomicrographs of cross sections of a) clean, and b) soiled acetate yarn, shows the dirt concentrated in the serrations of the fiber.

The upper photomicrograph in Figure 5 is of an unsoiled rayon carpet fiber. Most of its serrations are less than 4 microns in width and depth. The lower photomicrograph in Figure 5 shows the same type of fiber after soiling and vacuum cleaning. Dirt fills the serrations and centers in clusters around serrations. The clusters probably represent dirt aggregates, which accumulated during soiling or deposited as aggregates. In addition to relatively large serrations rayon fibers have micro roughnesses, in the range of tenths of a micron, as shown in Figure 6.

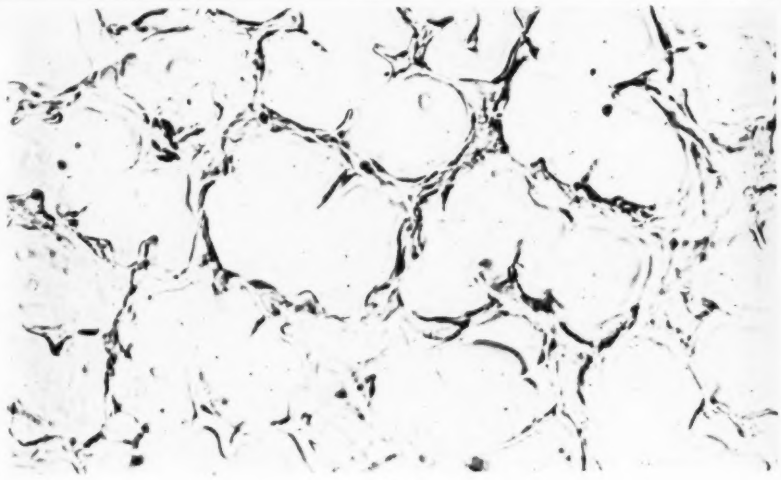
The cotton fiber also has both micro and macro rugosities as shown in Figure 7. Soil concentrates in the fiber folds of cotton in much the same manner as it collects in the serrations of viscose; see Figure 8.

The surface of a wool fiber is rough like that of other natural fibers. The macro roughness of wool is shown in the optical micrograph in Figure 9. The less widely recognized micro rugosities of the epicuticle are readily evident in the electron micrograph of a wool fiber in Figure 9. When wool fibers are soiled, the soil concentrates in localized rough areas, such as the scale tips, as well as in the micro rugosities as shown in Figure 10.

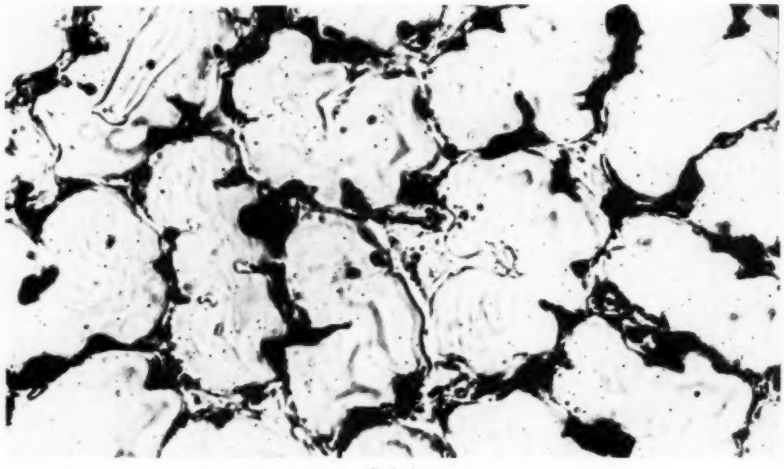
Not only do the cellulosic fibers and wool show these rough surfaces, but when examined with an electron microscope, the so-called smooth fibers, nylon (Figure 11a), polyester fibers (Figure 11b), and acrylic fibers (Figure 11c) also show the same irregularities which could serve as sites for dirt to accumulate.

TABLE II
FACTORS INVOLVED IN SOIL RETENTION

Soil particle size and shape *(20)*
Fiber shape *(16)*
Fiber surface smoothness *(10)*
Oil bonding *(9, 10, 15, 22)*
Electrostatic effects *(22)*



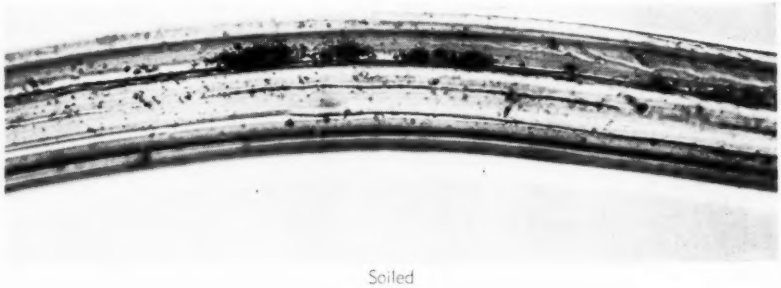
Clean



Soiled

Figure 4
Photomicrographs of acetate yarn (625X)

Unsoiled



Soiled

Figure 5
Optical micrographs of serrated viscose fiber (500X)

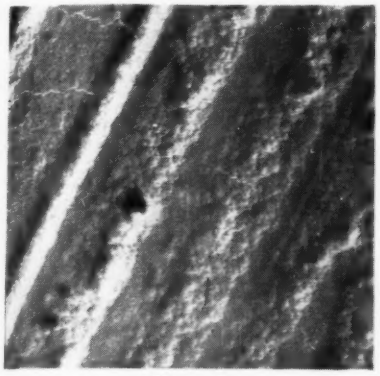


Figure 6
Electron micrograph of the surface of serrated viscose fiber (20,000X)

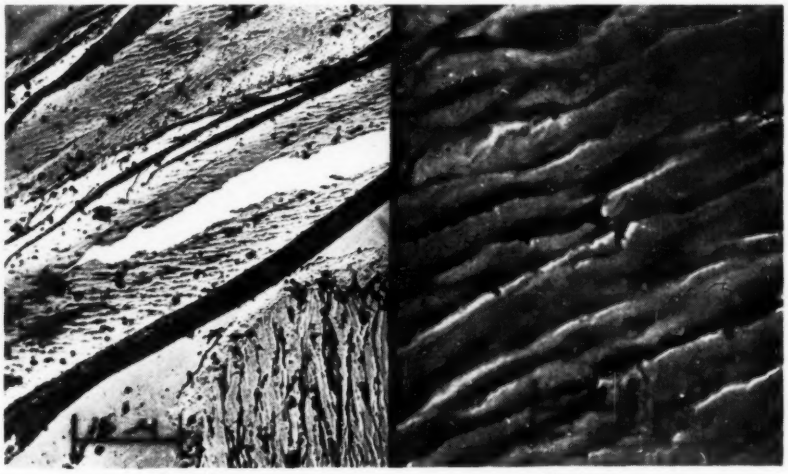


Figure 7 →
Optical and electron micrographs of cotton fiber

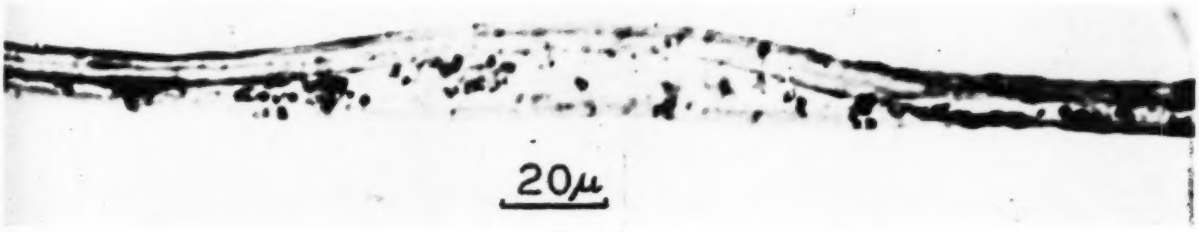


Figure 8
Optical micrograph of soiled cotton fiber

The relation between amount of dirt and reflectance loss varies from fiber to fiber and from soil to soil because of geometrical and light scattering factors *(5, 17, 21, 27)*. Soil particles that are deep within crevices will be less visible than particles on the outer surface of a fiber.

Fiber cross-sectional shape was recognized as important in soiling by Masland in 1939 *(16)*. The viscose fibers usually used in carpets have serrations in which soil particles may become wedged. Once lodged therein, the particles are less accessible for dislodging. Cotton fiber convolutions and wool scale interstices act similarly. Smooth rayon with a round cross-section accordingly shows less soiling.

OIL BONDING———Soiling is intensified by fiber oiliness. This fact has been observed in our laboratory on wool and viscose carpets, and has been described by Fortess and Kip *(9)* on acetate fibers and carpets. The manner in which oil exerts this effect is a combination of oil wetting of soil particles and mutual attraction of organic oil for organic fiber. The oil-fiber attraction would appear to be due to van der Waals' dispersion forces, but the wetting of soil particles, especially inorganic oxides, is less clear.

ELECTROSTATIC EFFECTS——— Electrical charge probably does not play an important role in soil retention. Schappel *(21)* has shown that charge characteristics do not parallel soiling characteristics in blends of viscose with nylon or Saran, even though static charge characteristics of the blends are similar to that of viscose alone. The rate of soiling of various fibers is markedly changed by treatment with Juvenon R. This treatment has no significant effect on the electrostatic properties of fibers as shown in Table III.

REDUCTION OF SOILING RATE

SOIL BARRIER ——— A soil-resistant finish appears to act like a dirt barrier *(8, 10)*. That is, the colorless soil-retardant particles occupy sites on the fiber, which would otherwise be occupied by soil particles. Once a carpet is "saturated" with soil or soil retardant, all subsequent impinging soil finds no unoccupied sites. It, therefore, cannot become firmly attached and may fall to the bottom of the carpet. In either case it is

TABLE III
EFFECT OF JUVENON R ON ELECTROSTATIC PROPERTIES

Fiber	Electrostatic Locator[1] Reading		
	Initially	After 1 Minute	After 10 Minutes
Viscose	0-2	0	0
Viscose, treated	0	0	0
Wool	2	0	0
Wool, treated	2	0	0
Acetate	6-7	6-7	4
Acetate, treated	3	0	0
Nylon	100	40	1
Nylon, treated	300	70	4
Dacron	500	400	300
Dacron, treated	500	500	400

[1] Made by Specialties, Inc, Syosset, N Y.

easily removed by vacuuming. The soil retardant may also be thought of as rendering the fiber surface relatively smooth.

The particle size distribution of Juvenon R, as determined by supercentrifuge techniques is shown in Table IV. The particles are found to be even smaller than those of natural soil. A comparison is shown in Figure 12 of the cumulative surface area vs particle size distribution of the natural soil, synthetic soil and Juvenon R. The small particles of Juvenon R, below 0.2 micron, are more abundant than those of natural soil. Consequently, the soil retardant should occupy those micro roughnesses which would otherwise entrap the minute dirt particles that are so difficult to remove.

Figure 13 shows a rayon fiber from an untreated carpet and one from a carpet which has been treated with a soil-resistant finish. The serrations are smoothed over by a film so that dirt cannot easily lodge therein. Figure 14 gives a comparison of treated and untreated rayon fibers from soiled carpets. This photomicrograph shows that the number of soil particles retained after vacuum cleaning is greatly diminished by the presence of the soil-retardant finish.

Electron micrographs of the surface of serrated viscose fibers were taken before and after treatment with Juvenon R and after the fibers were soiled. Figure 15a shows that Juvenon R forms a fairly continuous coating over portions of the surface. The serrations appear to be filled with the soil retardant as shown in Figure 15b, but often the surfaces around the serrations seem relatively bare.

The electron micrograph, Figure 15c, shows the presence of a large number of soil particles on the surface of untreated viscose fibers, which have been soiled and vacuumed. In contrast, Figure 15d shows

Electron Optical

Figure 9
Electron and optical micrographs of wool fiber

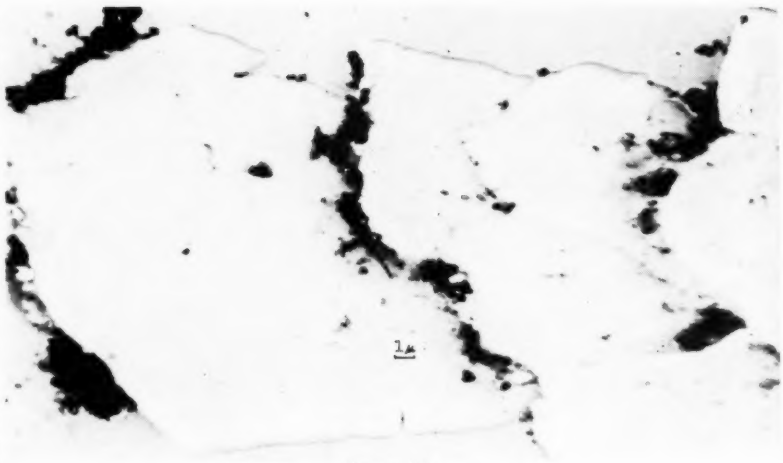


Figure 10
Electron micrograph of soiled woolen fiber

TABLE IV
PARTICLE SIZE DISTRIBUTION OF JUVENON R

Particle size (Microns)	*Weight (%)*	*Surface area (%)*
0.05-0.1	17.1	48.9
0.1 -0.2	27.2	26.2
0.2 -0.5	45.2	23.2
0.5 -50	10.5	1.7

TABLE V
PHYSICAL PROPERTIES OF JUVENON R

Appearance:	White, thixotropic dispersion
Solids:	20%
pH:	6.5-7.5
Viscosity at 25°C:	0.7-5.0 poises
Density, lb/gal:	9.4
Compatibility:	Compatible with most nonionic and anionic finishing agents and detergents used in rug cleanng.

TABLE VI
COMPATIBILITY OF JUVENON R WITH DETERGENTS

Detergent	*Manufacturer*	*Juvenon R, at 8 oz per gallon is compatible at detergent conc of* 1%	3%	5%	10%	20%
Miranol SM Conc	Miranol	Yes	Yes	Yes	Yes	Yes
Miranol C2M Conc	Miranol	Yes	Yes	Yes	Yes	Yes
Sipon L20 Ammonium-Lauryl Sulfate	American Alcolac	Yes	Yes	Yes	Yes	Yes
Sipon LT16 Triethanol-amine-Lauryl Sulfate	American Alcolac	Yes	Yes	Yes	Yes	Yes
Sipex S Technical Sodium-Lauryl Sulfate	American Alcolac	Yes	Yes	Yes	Yes	Yes
Wetsist W-1195	Jacques Wolf	Yes	Yes	Yes	Yes	Yes
Parnor Liquid J	Jacques Wolf	Yes	Yes	Yes	Yes	Yes
Detergent O-219	Jacques Wolf	Yes	Yes	Yes	Yes	Yes
Parnol 40	Jacques Wolf	Yes	Yes	Yes	Yes	Yes
Detergent CA-1835	Jacques Wolf	Yes	Yes	Yes	Yes	Yes
Orvus WA Paste	Procter & Gamble	Yes	Yes	Yes	Yes	No
Orvus Extra Granules	Procter & Gamble	Yes	Yes	Yes	Yes	Yes
Orvus AB Granules	Procter & Gamble	Yes	Yes	No	No	No
Karpet Kare, On Locaton Detergent	Bigelow-San'ord	Yes	Yes	Yes	Yes	Yes
Renex 35	Atlas Powder	Yes	Yes	Yes	Yes	Yes
Regal Beads	Armour	Yes	Yes	Yes	No	No
Mentor Beads	Colgate-Palmolive	Yes	Yes	No	No	No
Arctic Syntex HD	Colgate-Palmolive	No	No	No	No	No
Colgate Low Foam Detergent	Colgate-Palmolive	Yes	Yes	No	No	No

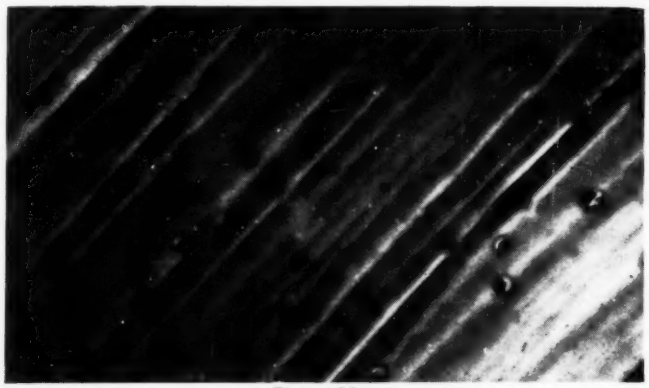


Figure 11a
Nylon (22,500X)

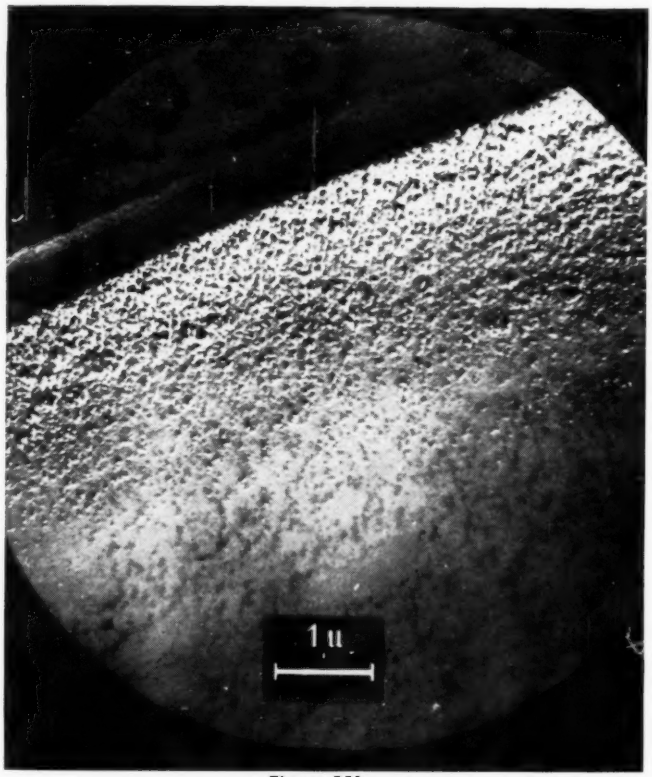


Figure 11b
Polyester (15,000X)

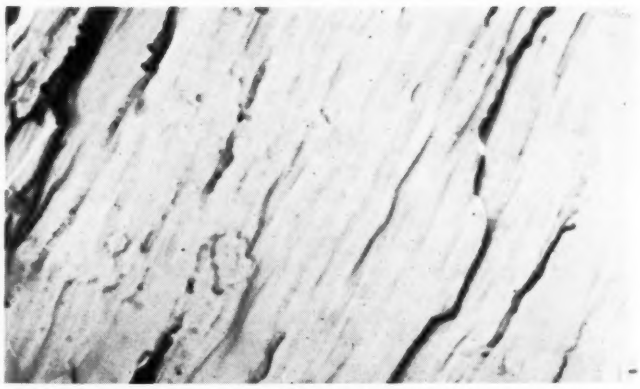


Figure 11c
Acrylic fiber (10,000X)

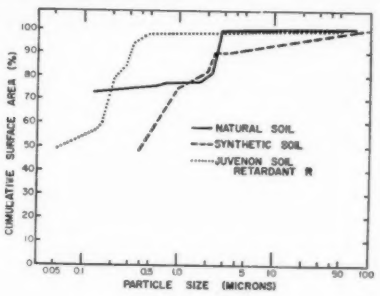


Figure 12

Particle size distribution

the presence of only a relatively few particles of soil on soiled and vacuumed viscose fibers, which have been treated with Juvenon R.

OIL BARRIER———Soil-retardant finishes may also act in another way — by interfering with oil bonding of dirt. The finish may constitute a barrier between the fiber and the oil in the dirt, preventing their mutual attraction. The finish particles may also absorb the oil sufficiently to prevent fiber-oil interaction. The former seems more likely, because an oil-soaked soil-retardant particle might itself become a site for oil bonding of soil, and because soil-retardant finishes perform better when applied to nonoily fabrics.

JUVENON R

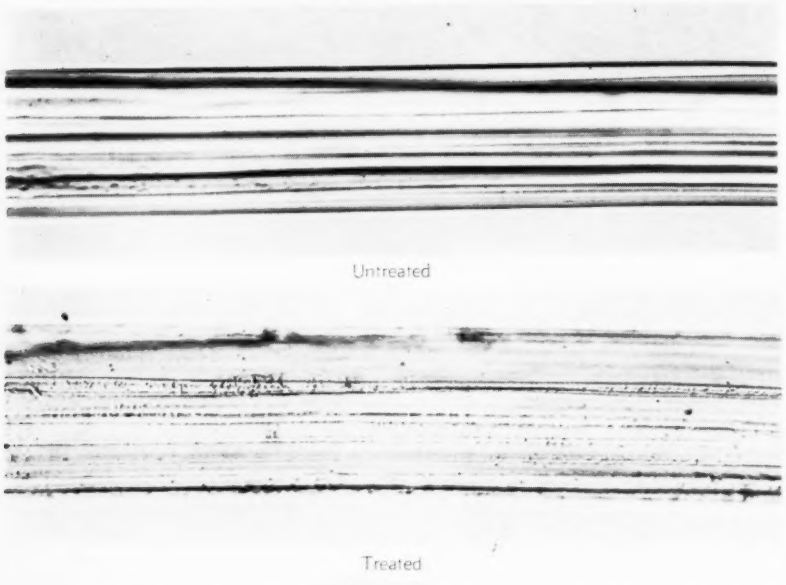
PROPERTIES———Juvenon R is a stable, white, thixotropic dispersion. It is readily diluted with water. Its physical properties are shown in Table V.

The concentration of Juvenon R in aqueous solutions can be readily measured by specific gravity determinations. Figure 16 shows the variation in specific gravity as a function of concentration and temperature. This method is an easy one to use for controlling the concentration of Juvenon R baths.

Juvenon R is compatible with most of the detergents used in the rug cleaning industry. The compatibility was determined by making up solutions to contain 8 oz per gallon of Juvenon R and up to 20% of the detergent to be evaluated. Fifteen of the nineteen detergents tested were compatible at the 5% level and eighteen were compatible at the 1 and 3% levels. The data are summarized in Table VI.

PROPERTIES OF TREATED FABRIC ———The properties imparted to fabric by treatment with Juvenon R are as follows:

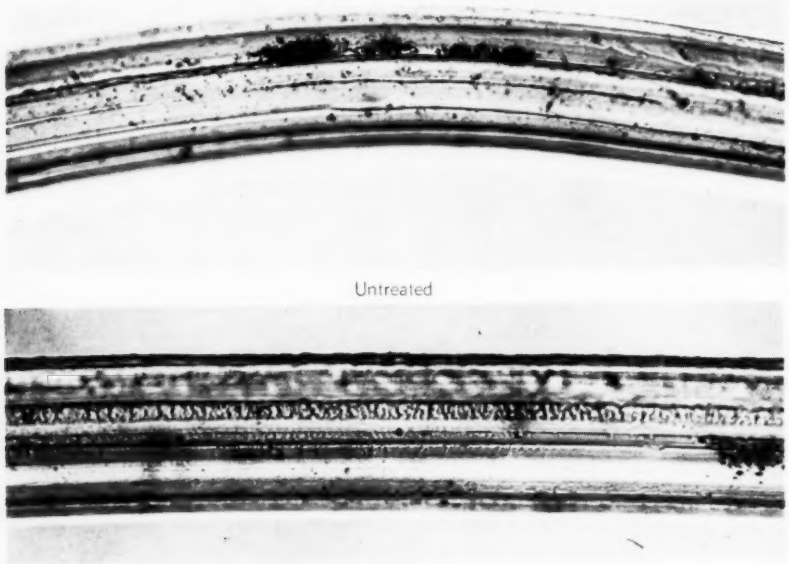
- Reduces rate of soiling
- Reduces frequency of cleaning
- Makes cleaning easier
- Keeps colors brighter and newer looking
- Has little or no effect on dye fastness
- Neither harshens the hand nor discolors appreciably
- Is not hygroscopic
- Does not affect static properties



Untreated

Treated

Figure 13
Optical micrographs of viscose fiber before and after treatment with Juvenon R (500X)



Untreated

Treated

Figure 14
Viscose fibers from soiled carpets treated and untreated with Juvenon R (500X)

APPLICATION OF SOIL RETARDANT BY CARPET MANUFACTURER

GENERAL———Juvenon R is relatively simple to apply. It may be applied with existing plant equipment but for certain types of application modifications may be required.

Like other textile finishing treatments, the optimum amount of soil retardant will depend on the type of fiber, construction of fabric, and method of application. Normally about 1-3% solids of Juvenon R based on the weight of the pile showing will be sufficient to give good soil-resistant properties.

To obtain the best soil-resistant properties the oil content of the pile should be as low as possible. Any oily residue on the pile will increase the soiling rate considerably. The oil in the backing should be nonmigratory and stainless or it will eventually appear in the pile and cause rapid soiling. Any plasticizer used in the latex backing should also be a non-migratory type.

The rug should be clean, free from salts, dyeing assistants and finishing agents. The pH of the pile should preferably be neutral or slightly alkaline, although Juvenon R may be applied to carpets having a low pH.

The soil retardant is applied as the last treatment before the final drying. Woven carpets are treated after the first shear and the steam operation which causes the pile to "bloom." All other mechanical finishing treatments follow the application of the soil retardant.

On dyed, latex-backed rugs, Juvenon R is applied either after the dyeing or after applying the backing, whichever is last. If piece dyeing is the last operation, much of the water can be removed by passing the carpet between squeeze rolls. The soil retardant can then be applied before the final drying.

It is not necessary to apply Juvenon R to the entire pile. On a dense pile, only the top quarter to third need be treated for best results. On less dense pile carpets, all the pile that will be exposed during use should be treated.

The dried, treated carpet may be through the usual mechanical finishing operations, such as shearing, without modification of the process. It is recommended that treated rugs be brushed and vacuumed after drying to improve the hand and appearance and to reduce any tendency towards dusting.

METHODS———Juvenon R can be applied by 1) spray, 2) pad, 3) furnishing roll, or 4) exhaustion techniques. The furnishing roll procedures are seldom used.

SPRAY——— Juvenon R is diluted with water to 2-3% solids and sprayed uniformly over the face of the carpet to deposit 0.75 to 1.5% solids based on the weight of the pile above the back. Spray application gives uniform distribution of the soil retardant. Carpets treated this way have excellent soil resistance and are free from dusting. The spray apparatus is relatively inexpensive and can be set up on conventional rug finishing equipment as is shown in Figure 17. The soil retardant may be applied to the carpet simultaneously with back sizing, thus saving a drying step. The treated carpet is dried in a conventional manner in a heated chamber or by tumble drying. Overdrying should be avoided since heat is not required to fix Juvenon R.

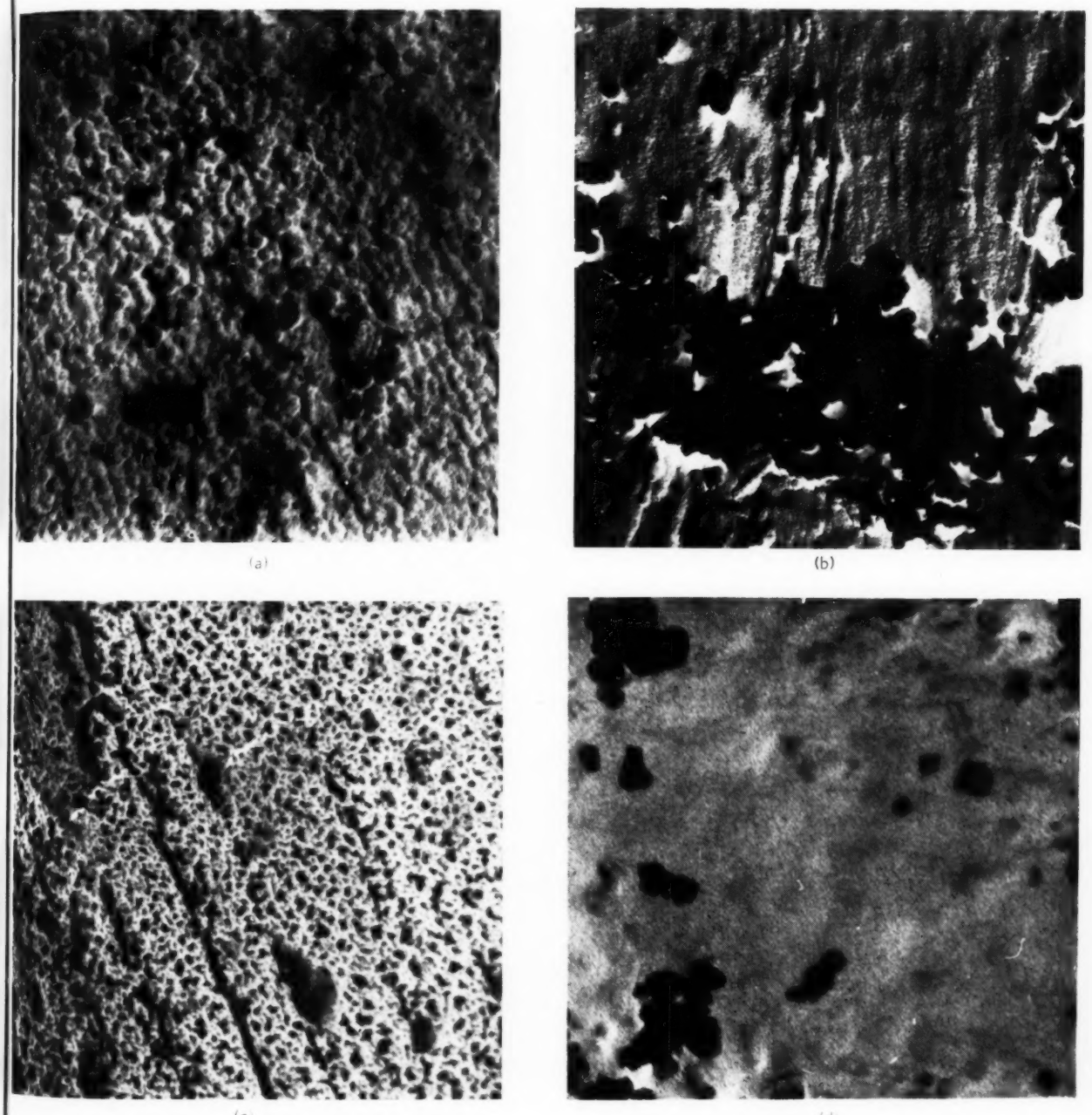
In spraying rugs, particularly those containing either wool or very dense piles, it may be necessary to use a wetting agent to wet out the fibers. One to two percent

of Deceresol Wetting Agent NI Conc, based on the weight of Juvenon R, is effective. High concentration of Deceresol NI Conc should not be used since the soil resistance will be diminished.

The rug is passed through an aqueous dispersion of diluted Juvenon R; then through squeeze rolls to remove the excess liquor, followed by drying. About 1 to 3% solids of soil retardant should be applied based on the weight of the pile above the backing.

FURNISHING ROLL——— Juvenon R may also be applied by a furnishing roll in the same manner as backsizing.

EXHAUSTION———Juvenon R may be exhausted on various fibers. The



(a) (b) (c) (d)

Figure 15
Electron micrographs of viscose fibers

(a) and (b)—Unsoiled viscose treated with Juvenon R (20,000X)
(c)—Soiled and vacuumed, untreated viscose (20,000X)
(d)—Soiled and vacuumed viscose, which had been treated with Juvenon R (52,000X)

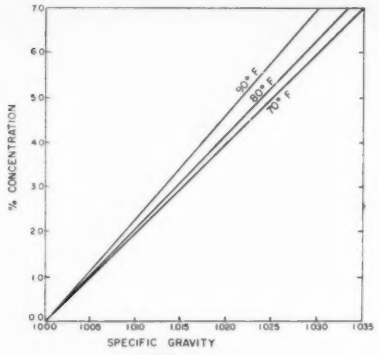


Figure 16

Specific gravity of Juvenon R as a function of concentration and temperature

treated carpets show no dusting or whitening and less change in hand than produced by other methods of application.

The soil retardant may be applied by the exhaustion method in the last rinse bath following dyeing. The recommended procedure is to agitate the carpet for 3 to 5 minutes in a 10:1 liquor to cloth ratio bath containing 1.75% of commercial aluminum sulfate (17% Al_2O_3) based on the weight of the rug. About 1 to 3% solids Juvenon R based on the weight of the carpet is then added to the bath and the carpet is agitated for an additional 20 minutes at room temperature or preferably at temperature up to 180°F. The carpet is then passed through squeeze rolls and dried in the usual manner.

APPLICATION BY RUG CLEANER

PLANT———Carpets are cleaned by several different methods at rug-cleaning plants. Juvenon R has been successfully applied to several hundred rugs at a commercial rug cleaning plant with excellent results. At this plant the cleaned, wet rugs were passed through squeeze rolls to remove as much water as possible before entering the last rinse box which contained from 2 to 4% Juvenon R. Sufficient soil retardant was added at intervals to the bath to maintain constant concentration. The carpet was then passed through a second set of squeeze rolls into the dryer. Under these conditions 0.75 to 1.5% Juvenon R solids, based on the weight of the pile above the backing, was applied to the carpets.

Some rug cleaners use a laundry wheel to clean cotton rugs which are not rubber-backed. The exhaustion method has been used successfully in this equipment.

In many smaller cleaning plants, the rugs are spread on the floor and scrubbed with a rotary brush much as rugs are cleaned in the home. The rug is then rinsed in a bath, passed through squeeze rolls and dried. Juvenon R can be applied in the final rinse bath or can be sprayed on the clean carpet.

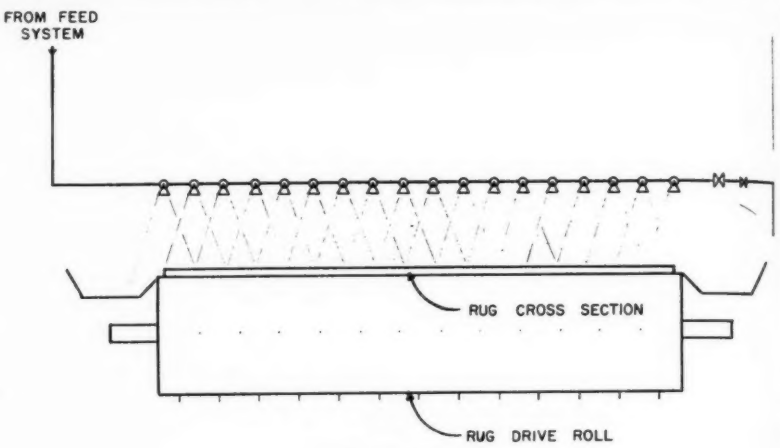


Figure 17
Spray system

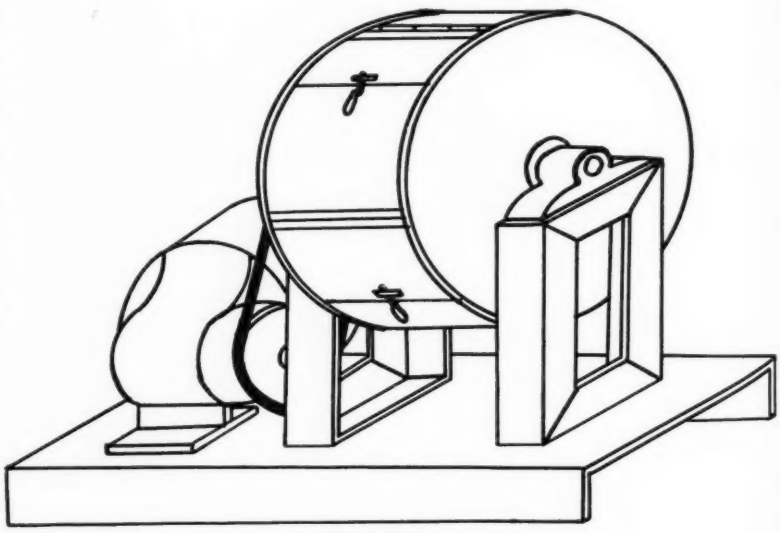


Figure 18
Laboratory soiling apparatus

ON-SITE———Juvenon R can be applied together with the detergent during "on-location" rug cleaning, thus, simultaneously cleaning and making the carpet soil-resistant. This method has been successfully evaluated commercially on a limited basis.

All loose dirt and spots should be removed as usual before the rug is shampooed. Using a compatible detergent, about 8 ounces of Juvenon R is mixed with sufficient diluted detergent to make one gallon. The rug is shampooed with a rotary brush cleaner and the suds removed in the conventional manner. After the rug has dried, a thorough vacuuming is recommended in addition to any other brushing normally done to raise the pile.

A better soil-resistant finish is obtained if the soil retardant is applied to rugs which have already been cleaned "on-site." A power spray, such as a Brewer Air-Gun, which produces a fine mist, should be used. One pint of Juvenon R diluted to a gallon is usually sufficient to treat a 9′ x 12′ rug by this method. The soil retardant may be applied to the shampooed rug before it has dried. After the rug has dried, it should be thoroughly vacuumed and, if necessary, brushed to restore the pile.

APPLICATION TO FABRIC OTHER THAN CARPETS

Juvenon R is an effective soil retardant

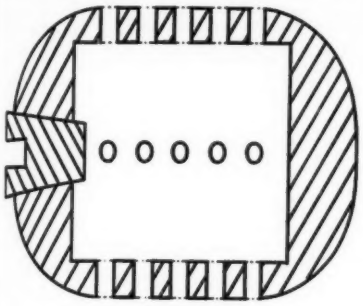


Figure 19
Soil capsule

TABLE VII
COMPOSITION OF SYNTHETIC SOIL

%	*Ingredient*	*Supplier*
38	Peat Moss	Michigan Peat, Inc, Capac, Mich.
17	Cement	
17	Kaolin Clay, Peerless	R T Vandervilt Co, Park Avenue, New York, N Y.
17	Silica (200-mesh)	Davison Chemical Corp, Baltimore, Md.
1.75	Molacco Furnace Black	Binney & Smith Co, New York, N Y.
0.5	Red Iron Oxide N-1860	C K Williams Co, Easton, Pa.
8.75	Mineral Oil (Nujol)	Standard Oil Co of New Jersey, Elizabeth, N J.

for pile fabrics such as those used for upholstery and draperies, and for flat fabrics. Padding followed by drying is the preferred method of application to these fabrics. The amount of soil retardant used will vary with the fiber and the construction of the fabric. However, in general, 1-5% solids based on the weight of the fabric gives satisfactory results.

APPLICATION TO MATERIALS OTHER THAN TEXTILE FABRICS

Juvenon R is effective in retarding the rate of soil of many materials which are easily soiled, such as wallpaper, lamp shades and painted surfaces.

ACCELERATED LABORATORY SOIL TEST

EQUIPMENT———In determining the value of a soil-resistant finish, an accelerated laboratory ball mill soil tester is used. In this equipment, samples of the untreated and treated carpets are soiled with a synthetic soil, then vacuumed, and the difference in reflectance between the treated and untreated samples is used to determine the effectiveness of the soil-resistant finish.

The ball mill soiling apparatus is constructed *(26)* as shown in Figure 18. The ball mill is equipped to hold four samples of fabric on its periphery. The apparatus rotates at 65 rpm with the direction of rotation reversing every two minutes.

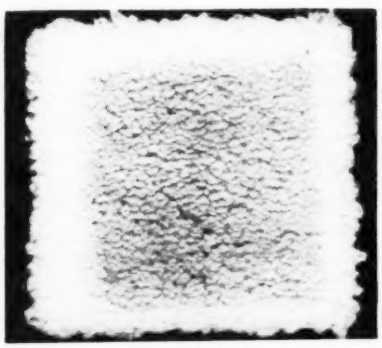
The reflectance of the fabric samples can be measured with 1) a Photovolt photoelectric meter, Model 610, using a green tristimulus filter and 610-D search unit, 2) a spectrophotometer using the reflectance at 557mμ, 3) a Color Master[2], using a green filter only, or 4) a Color Eye[3], using a green filter only.

[2] Engineering and Equipment Corp, Hatboro, Pa.

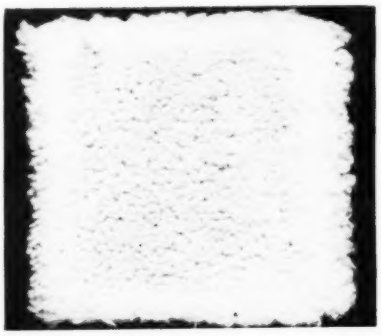
[3] Instrument Development Labs, Needham, Mass.

The soil capsule shown in Figure 19 contains holes through which the soil is deposited on the fabric sample.

SYNTHETIC SOIL———The synthetic soil *(8)* used in this soiling test is prepared by blending the ingredients in Table VII. The blend is placed in a large pan and dried in a forced draft convection oven for 8 hours at 50°C. The dried mixture is ball milled with ceramic balls for at least 25 hours. The resulting soil is stored over $CaCl_2$ or H_2SO_4 in a desiccator.



Untreated, soiled



Treated, soiled

Figure 20
Viscose carpeting exposed in the laboratory soiling apparatus

METHOD———Two samples each of the treated and untreated carpets are cut into 5" x 5" squares. The reflectance of the samples are determined before soiling. It is important that the pile of all samples face in the same direction during the reflectance measurements. The test samples are placed on the rim of the ball mill with the pile of each sample facing in the same direction. The synthetic soil is measured into the soil capsule and placed into the ball mill along with sixty steel balls, ½" in diameter. The ball mill is run for 20 minutes. The samples are removed and cleaned with an ordinary home vacuum cleaner using an upholstery attachment. The samples are cleaned by stroking the nozzle across the face of the pile 10 times in each of the four directions. The last 10 strokes should be in the direction of the lay of the pile. The reflectance of the soiled samples is then determined.

Figure 20 shows viscose carpet after exposure to soiling in the laboratory apparatus and vacuuming. The difference in appearance of the untreated and treated carpets is readily evident.

The degree of soiling may be expressed in several different ways. The Kubelka-Munk *(14)* formula can be adapted to the determination of the "Apparent Soil" by the following equation:

$$\text{Apparent Soil} = \frac{(1 - R_s)^2}{2R_s} - \frac{(1 - R_u)^2}{2R_u}$$

where R_s and R_u are the fraction of light reflected from the soiled and unsoiled carpet respectively. This equation is most useful when comparing light and dark carpets, as the equation tends to compensate for differences in initial reflectance of the various samples provided the fiber and carpet construction are the same.

The following Soiling Index is a method of expressing the effectiveness of a soil retardant finish.

$$\text{Soiling Index} = \frac{\text{Apparent soil of treated}}{\text{Apparent soil of untreated}}$$

The lower the Soiling Index the better the soil-resistant treatment.

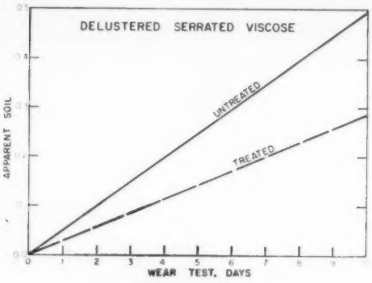


Figure 21

Rate of soiling of delustered viscose carpet before and after treatment with Juvenon R

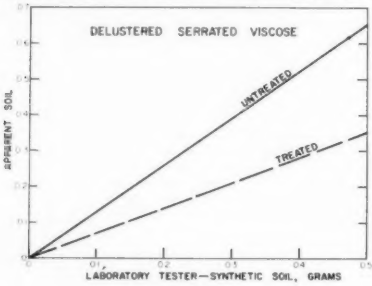


Figure 22

Rate of soiling of delustered viscose carpet before and after treatment with Juvenon R

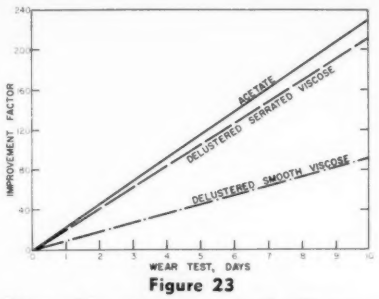


Figure 23

Effect of Juvenon R on rate of soiling acetate and viscose carpets

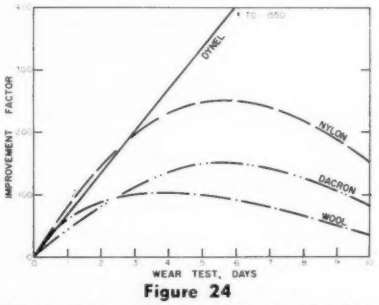


Figure 24

Effect of Juvenon R on the rate of soiling of wool and man-made fibers

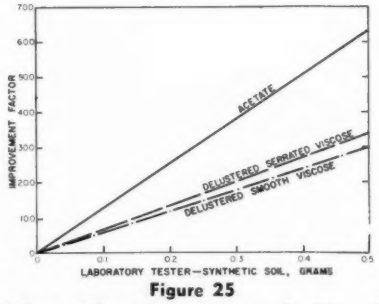


Figure 25

Effect of Juvenon R on rate of soiling of acetate and viscose carpets

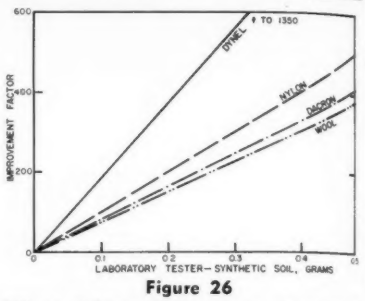


Figure 26

Effect of Juvenon R on rate of soiling of wool and man-made fibers

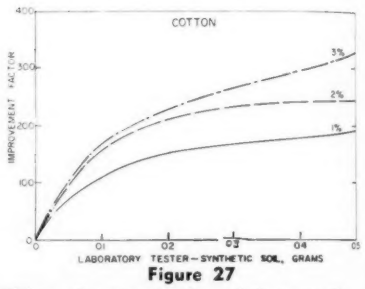


Figure 27

Effect of concentration of Juvenon R on the rate of soiling of cotton

JUVENON R ON VARIOUS FIBERS

TREATMENT———Two series of experiments were run to determine the effectiveness of Juvenon R on different fibers. In the first experiments, standard 5/16-inch-pile Axminster carpets having nonmigratory finish on the jute filling were used. They were obtained through the courtesy of the American Viscose Co. The carpets were given a standard mechanical finishing and then cleaned with naphtha to remove the oily finish. The pile fibers in these carpets were: acetate, Dynel, Dacron, nylon, wool, delustered serrated viscose and delustered smooth viscose respectively.

Samples of each carpet were padded with 1% solids Juvenon R based on the weight of pile and dried 30 minutes at 235°F in a tumble dryer. Samples of treated and untreated carpets were placed in our laboratory corridor where they were subjected to heavy traffic. The carpets were vacuumed and their positions changed every day for 10 days.

RATE OF SOILING———The reflectance of the various samples was measured initially and after each vacuuming. The apparent soil values for each day were readily calculated by using the tables prepared by Stearns *(23)*. Results shown in Figure 21 for delustered, serrated viscose are typical of those obtained with the other fibers. The apparent soil increases with the time of exposure of each rug.

The reflectance and apparent soil values were also determined after exposing samples of the treated and untreated carpet to six cycles of the laboratory accelerated soil tester. In the latter tests 0.05 g of synthetic soil was used in the second cycle, and 0.1 g additional soil was used in each of the next four cycles. The reflectance was measured and apparent soil values were calculated. The results plotted in Figure 22 for delustered, serrated viscose are typical of those obtained with

TABLE VIII

IMPROVEMENT FACTOR: DECREASE IN SOILING BY APPLICATION OF 1% JUVENON R

Days	*Acetate*	*Dacron polyester fiber*	*Dynel*	*Nylon*	*Wool*	*Delustered smooth viscose*	*Delustered serrated viscose*
			WEAR TEST				
1	42	9	73	69	20	8	10
2	82	10	160	28	76	21	93
3	117	42	245	28	84	37	96
4	109	89	348	233	87	37	106
5	87	64	348	223	87	41	130
6	105	70	348	279	92	41	130
7	160	142	404	97	21	8	125
8	218	155	634	69	20	50	156
9	217	96	1558	140	21	102	196
10	215	96	1558	140	20	102	196
			LABORATORY TEST				
Synthetic Soil (gms)							
0.05	66	167	111	152	120	57	59
.1	144	250	282	223	187	104	135
.2	243	301	385	268	169	115	116
.3	347	226	438	238	279	197	196
.4	482	136	648	322	325	234	247
.5	622	404	1354	342	355	300	340

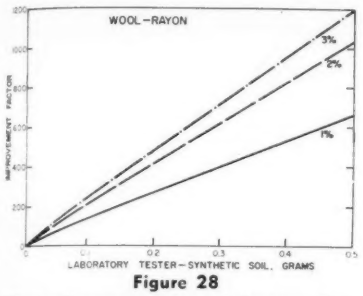


Figure 28

Effect of concentration of Juvenon R on the rate of soiling of wool-rayon

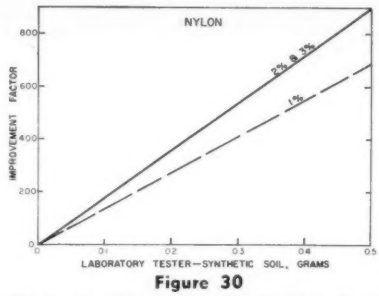


Figure 30

Effect of concentration of Juvenon R on the rate of soiling of nylon

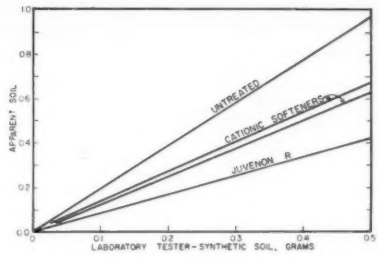


Figure 33

Comparison of soil-retardant agents applied by padding techniques

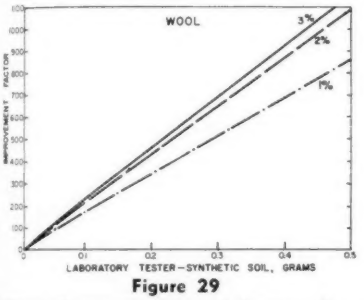


Figure 29

Effect of concentration of Juvenon R on the rate of soiling of wool

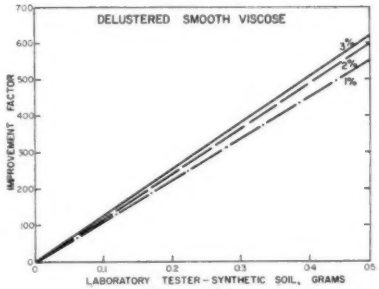


Figure 31

Effect of concentration of Juvenon R on the rate of soiling of delustered smooth viscose

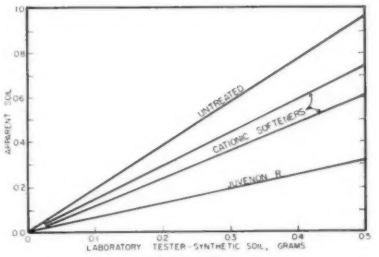


Figure 34

Comparison of soil-retardant agents applied by spraying techniques

the other fibers. As expected, the apparent soil values increase with the amount of soil.

IMPROVEMENT FACTOR——A good way to evaluate the soil-resistant properties conferred by a soil retardant is to compare the improvement of treated fibers over that of untreated fibers. The Improvement Factor (IF) is defined as the apparent soil value of the untreated fiber (S_u) minus the apparent soil value of the treated fiber (S_t) after similar exposure to soil, multiplied by 1000.

$$IF = 1000 (S_u - S_t).$$

The Improvement Factor was calculated for the wear test and laboratory test results as shown in Table VIII. The value of a soil-retardant finish increases as the carpet is exposed to larger quantities of soil. This is shown in Figures 23 and 24, which summarize the wear test results and in Figures 25 and 26 where the results of the laboratory tester are given. The Improvement Factor reaches a maximum; then decreases with wool, Dacron, and nylon, but not with Dynel, viscose or acetate. These data indicate that more Juvenon R should be used with the wool, Dacron, and nylon.

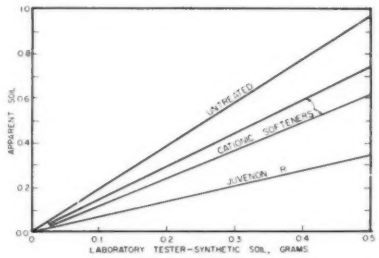


Figure 32

Comparison of soil-retardant agents applied by exhaustion techniques

LABORATORY AND WEAR TEST CORRELATION——The correlation coefficient *(2)* between the laboratory test and wear test results was found to be 0.91 for untreated and 0.86 for the treated samples. These values indicate high significance for six degrees of freedom and show that the laboratory test does predict well what is actually observed in wear.

OPTIMUM CONCENTRATION——The optimum amount of Juvenon R for a given fabric varies with the type of fiber and construction of the fabric. In a second series of experiments commercially available carpets composed of 1) wool, 2) 50-50 wool-rayon blend, 3) nylon, 4) cotton, and 5) delustered smooth viscose were padded with 1, 2, and 3% Juvenon R based on the weight of the pile above the backing. The treated carpets were soiled in the laboratory tester as described previously.

The Improvement Factor was calculated for these treatments. The data is shown in Table IX and plotted as a function of concentration of Juvenon R for wool, wool-rayon blend, nylon, cotton and delustered smooth viscose, in Figures 27, 28, 29, 30 and 31 respectively. The application of 1% Juvenon R reduced the rate of soiling in every case, and a higher concentration further reduced the soiling rate. The data indicate that 2% Juvenon R is required for the wool, wool-rayon, nylon and cotton carpets while 1% is probably sufficient for the viscose.

When the data from the second series of experiments are compared with those of the first, the two samples of nylon and of wool are seen to soil at different rates.

TABLE IX

IMPROVEMENT FACTOR: DECREASE IN SOILING BY APPLICATION OF VARIOUS CONCENTRATIONS OF JUVENON R

	Wool			*Wool-rayon*			*Nylon*			*Cotton*			*Delustered smooth viscose*		
Juvenon R, %	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*	*1*	*2*	*3*
Synthetic Soil (gms)															
0.05	191	228	228	70	222	264	258	197	197	58	55	67	44	53	58
0.1	398	506	503	125	361	468	325	348	348	136	161	169	110	130	115
0.2	579	691	718	265	558	698	366	403	403	171	208	227	206	262	267
0.3	510	729	714	400	746	946	468	538	538	171	243	243	128	165	177
0.4	628	860	887	535	794	999	533	717	717	181	221	280	459	517	521
0.5	785	1088	1115	660	1025	1207	609	826	826	187	236	334	526	599	625

Juvenon R was more effective on the second set of samples than it was on the first. This difference is probably due to differences in the fibers used in the wool samples and to differences in carpet construction.

A serrated viscose carpet was treated with 1% Juvenon R and two cationic softeners recommended for use as soil retardants by exhaustion, padding and spraying techniques.

The soil-resistant properties of these materials were compared using the laboratory tester. The apparent soil values in Figures 32, 33 and 34 show that the two cationic softeners are about equivalent. Although these cationic softeners do impart some soil-resistant properties to the rayon carpeting, the amount is very small compared to that imparted by Juvenon R.

These data also show that better soil-resistant properties are obtained with Juvenon R by exhaustion or spraying than by padding techniques. The method of application did not make much difference with the cationic softeners.

The hand of carpets treated with the cationic softeners is naturally softer than that treated with the Juvenon R.

SUMMARY

The recent trend towards using increasing amounts of synthetic fibers and lighter pastel shades in carpets has led to a need for reducing the rate of dry soiling. To fill this need an effective soil retardant, Juvenon R, has been developed.

The general mechanism by which soiling occurs is discussed. Also, theories are developed to explain the action of a soil retardant. It is believed that electrical charge has little effect in retention of soil by carpets. Van der Waals' forces, oil bonding and wedging of irregular-shaped soil particles in pores in the fiber are important factors in soil retention. It is believed that Juvenon R acts as a soil barrier; that is, its colorless soil-retardant particles occupy sites which would otherwise be occupied by soil particles.

Juvenon R can be applied by the carpet manufacturer in existing equipment. It can also be applied by a rug cleaner either in his plant or "on-location." The amount of soil retardant required will depend on the fiber, the construction of the fabric and the method of application. Generally, concentrations of 1-3% are required.

An accelerated laboratory test for a soil-resistant finish is described. Data are presented showing good correlation between this accelerated soil test and service wear tests. Data are given showing the effectiveness of Juvenon R on a number of different fibers.

Although most of the work with Juvenon R has been on carpets, it is also an effective soil retardant on other pile fabrics, as well as flat fabrics. In addition, it is an effective soil retardant for other surfaces such as wallpaper and painted surfaces.

ACKNOWLEDGMENT

The authors wish to express their appreciation to Joseph W Schappel of the American Viscose Corp for furnishing many of the carpet samples used in this study, and to Nelson F Getchell of the National Cotton Council for permission to use several photomicrographs.

The authors wish to acknowledge the aid of many associates in the American Cyanamid Co including: Louis Bini, Glenn Coven, Ray Krammes, James Leineweber, H E Millson, L J Moretti, T G Rochow, George Switlyk, William van Loo and Emil Vitalis.

QUESTIONS AND ANSWERS

Question: Do you have any data on the soil resistance of Orlon?

Answer: We have found that the soil-resistant properties of Orlon were improved quite markedly by the addition of Juvenon R, but we do not know the optimum concentration.

Q: What is the effect of Juvenon R on abrasion resistance?

A: We have conducted several kinds of laboratory abrasion tests, but I question their value. We have received no adverse reports relative to wear tests. I would say that we have no results relative to abrasion resistance.

Q: You mentioned a percentage of somewhere around 3 owf above the backing. Yet I believe you said it applied to the upper tips of the fiber. Do you mean the function is higher where it is actually applied?

A: Correct. If you have a loose pile, you will have to treat everything which might be exposed to soil. If you have a dense pile, you have a higher concentration. That is why we say that, in spraying, you can use less than 2 percent.

Q: It becomes apparent then that variations in the amount of Juvenon R finish is going to be important with regard to defects showing up later when the carpet is in use. You have made checks of the evenness of the Juvenon R?

A: We can readily determine how much is on.

Q: I have in mind control during the application.

A: We can determine it analytically, but it would mean destroying the carpet or taking samples out of it. We have no means, such as Geiger counters, to measure this, although we have sought such a means.

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Minutes——

187th Meeting

TECHNICAL COMMITTEE ON RESEARCH

THE Technical Committee on Research held its 187th meeting on January 20, 1956 at the Hotel Statler, New York, N Y with the following members present: R B Smith, W E Coughlin, H G Sommar, M W Winkler, R L Stutz, G Wham, H C Donaldson, Jr, L S Little, W M Scott, F T Simon, R E Derby, Jr, G Wernz, W Klaas, B P Black, R H Souther, A H Gaede, H A Desmarais, R C Allison, C H Schmitt, H L Young, J K Sumner, T R Smith, P J Wood, H E Hager, C A Baker, J E Norton, F J Rizzo, P J Fynn, H Y Jennings, W S Holst, C A Sylvester, C W Dorn, M J Babey, H W Stiegler, R W Jacoby, and J A Woodruff, secretary.

L S Little opened the meeting with comments on the past and future work of the Technical Committees with particular reference to the ISO meetings scheduled for September 6, 7, and 8 for which the ASA, ASTM, and AATCC will have to be well prepared on the items of Colorfastness and Shrinkage in Laundering.

C W Dorn announced changes in Committee Chairmen as follows: *Stream Pollution*—R H Souther; *Pressing*—M Bidell; *Antimicrobial Agents*—J Schwartz; *Resistance to Abrasion*—T F Cooke; *Flammability of Clothing Textiles*—R C Geering; *Drycleaning Test Methods*—A E Johnson; *Evaluation of Fire-Resistant Textiles*—L L Heffner.

Mr Dorn then named the new officers of the Technical Committee on Research: C A Sylvester, *chairman;* M J Babey, *vice chairman;* J A Woodruff, *secretary.*

The Research Committee meetings are now held in one day from 10 am-12 noon, 1 pm to 3 pm, and 3 pm to 5 pm. In order to avoid so many conflicts, as are now being experienced, it was suggested that the schedule be changed to 9-11, 11-1, 2-4, 4-6, and 7-9. Meetings can also be held on the morning of the next day. The motion was made by Mr Fynn that this suggested schedule be tried at the next series of meetings. The motion was seconded and voted affirmatively.

A letter from K Barnard suggested that a reference committee be formed to see where possibilities exist for the use of radioactive techniques in test methods. A motion was made, seconded, and voted affirmatively to ask approval of ECR for TCR to set up a reference committee to act in advisory capacity on this subject.

Mr Jacoby expressed his and the society's thanks to Mr Little for his leadership in organizing and guiding the research groups of AATCC. This research work has been recognized by corporate members, and letters were read by Mr Jacoby to illustrate corporate members' comments. Mr Jacoby expressed his best wishes to the new officers of TCR and ECR.

After a suggestion by Ralph Smith, and discussion, a statement was made by the chairman that all committees should try to make use of the work of other committees, perhaps using the "Newsletter" as the means of communication.

A motion was made, seconded, and voted affirmatively to authorize the chairmen of ECR and TCR to reorganize the listing of test methods in the *Year Book.*

A request was made that the secretary of TCR poll the listed members by form letter to see if each one is desirous of remaining an active member.

REPORT OF THE DIRECTOR OF RESEARCH

H W Stiegler reported on research at the AATCC laboratories.

The arrangement of data from the "Operation Cue" (thermalradiation exposures) is nearly complete and should soon be ready for report.

Glenn Kidder, formerly of Lever Brothers, has been hired for work on the laboratory staff.

The Accelerotor work is largely complete insofar as instrumentation is concerned. It is now up to the Abrasion Committee and to industry as to further action.

Some work is being done on Dynamic Absorption with and without the aid of the Quartermaster Depot.

Mounting light fastness tests for the Committee continues.

The Flammability of Textiles Committee plans further work at the laboratory.

Shrinkage testing work is being continued for evaluation for the ISO.

It was mentioned that Dr Stiegler had been consulted on the space requirements for the new laboratory to be constructed by Lowell Technological Institute. It would have roughly two times the present space.

SUBCOMMITTEE REPORTS

RESISTANCE TO ABRASION *(M W Winkler)*——The Abrasion Committee during 1955 continued with inter-laboratory studies, eliminating with each successive study those factors or variables that seemed to lie in the path of correlating the results of participating laboratories. Fabrics used were regular mill runs, some of which were dyed but not finished, while others were dyed and finished, in order to determine any correlation of the results inter-laboratorywise.

The most recent study on the Stoll machine included the checking of the results by the technical representative of Custom Scientific Instruments Inc, as follows: Samples were first run by the flex tester operator of each laboratory, while corresponding samples were run by the CSI representative at his plant. This representative then visited the laboratories participating in this study and personally ran samples of the same fabric. The results of this study again indicate that, as of today, we have not found any correlation of Stoll flex abrasion results between laboratories.

In view of the above, the Committee decided to correlate all the studies of the past three years, submit them to a steering committee for a recheck of all available data, and then announce its final conclusion.

With respect to abrasion data, using the Accelerotor as the abradant instrument, the Committee, with the assistance of Dr Steigler, can report that this instrument has been modified to eliminate such variables as uneven diameter of the housing chamber. The regulation of the unit and use of a specific speed have been determined, and we are ready to give recommendations as to the type of abradant to be used for a given fabric. A new inter-laboratory study will, in all probability, be planned in the near future.

Because the three-year term of the present chairman of the Abrasion Committee ended with the last meeting, Theodore F Cooke was nominated and voted into the chairmanship for the next term, with the present chairman retaining the secretaryship of the Committee.

STANDARD SOILS *(O C Bacon)*——— The Committee has composed a rough draft of a tentative standard method of using soiled fabrics in the evaluation of detergents. The method will be essentially the same as that mentioned in the progress report already submitted. A proper title will be supplied along with a principle, scope and interpretation of results.

The Committee voted to do no more inter-laboratory work pending reaction and comment pertaining to the work completed.

A subcommittee on the soiling of rugs and carpets met immediately following the regular meeting. The subcommittee will submit their proposed agenda of work to TCR.

COLORFASTNESS TO WASHING *(P J Fynn)*———The Committee voted to make several minor changes of an editorial nature to tests 36-54 and 61-54. More serious changes were presented for the approval of the Technical Committee on Research, namely:

To change the wording of Purpose and Scope of test 36-54. At present it is stated erroneously to be a test to produce color loss similar to that produced by commercial and domestic washing.

To make the wording in the "Staining" section read alike for both test 36-54 and 61-54 in view of work done recently by the Committee, which showed no practical difference in the staining obtained by either method.

The Committee approved the presentation to the Technical Committee on Research of a motion to:

1) Rearrange the order of presentation of tests in the *Year Book* so that like tests are grouped together instead of being scattered about under two sectional titles that mention colorfastness only.

2) Remove the individual tests for colorfastness of wool and silk to commercial and domestic laundering. It is felt that methods 36-54 and 61-54 apply to fabrics of all fibers. With removal of these two individual tests all colorfastness tests should be grouped under a sectional heading of "Colorfastness of Textiles" (leaving out "of cotton and linen") and all other tests should be under another sectional heading, such as Physical and Chemical Tests. This would render superfluous the wording: "These tests are also applicable to textiles made of manufactured organic fibers."

A paper setting forth the rationale of the washfastness tests was approved for publication (after indicated corrections and additions) in the *Dyestuff Reporter* and several trade papers.

A paper was approved, for publication in the *Dyestuff Reporter*, giving results of committee work just completed on the effect on washfastness test methods of substituting for the standard soap syndets with and without optical brighteners and soap with an optical brightener added.

Further work is indicated for extending the washing procedures of the Alternate Light Exposure and Washfastness Test to the 2A and 4A test procedures.

The new project for creating a washfastness test to predict behavior of industrial work clothes to conditions of industrial laundering is to get underway with the arrival of fabrics from the Quartermaster Corps.

CHLORINE RETENTION *(H Y Jennings)*———A report was presented, which gave the reasons of this Committee as to why the present test is not being correctly used or interpreted. A written comment is being prepared for the *Year Book*.

DIMENSIONAL CHANGES *(H C Donaldson, Jr)*———Work is being carried on in connection with a gradation of severity of tests. This is being done by a subcommittee under the direction of Dr Wham. G J Mandikos is to prepare a program concerning a restorability test in regards to shrinkage. This would be done at the AATCC laboratories at Lowell.

STREAM POLLUTION *(R H Souther)* ———The Committee expects to distribute reprints of the paper by E A Leonard, which was published in the *Dyestuff Reporter*. An article by Ralph Smith is nearly ready.

STANDARD TEST FABRICS *(G W Wernz)*———During the past year the Committee has succeeded in developing a specification for the production of the Standard six-fiber test cloth, which is recommended in various official AATCC test procedures. This improved cloth, which contains spun yarns of acetate, cotton, nylon, silk, rayon and wool, has been approved by the Technical Committee on Research by letter ballot with no dissenting votes. The use of an Orlon-81 warp yarn instead of nylon has met with very favorable comments from laboratories because the nonstaining Orlon does not interfere with the appearance of the other fibers for test ratings.

There have been comments concerning the slightly heavier staining of spun nylon versus the discontinued filament nylon. This was anticipated by the Committee, but it was felt that the test results would be more in line with realistic requirements of the industry.

The official "Specification for Production of Standard Six-Fiber Test Cloth" has been filed with the offices of the AATCC and contains pertinent information concerning yarn procurement, weaving and finishing data. Testfabrics, Inc is the present producer and distributor of the AATCC fabric, and it will adhere to the Specification for reasonable continuity of quality.

Specifications have also been filed with AATCC for production of 80 x 80 bleached, desized cotton and for the 96 x 100 Standard Crockmeter cloth.

COLOR *(F J O'Neil)*———The Small Color Difference Committee has been absorbed by this Committee.

The Quartermaster Corps has requested a reconsideration of color ratings. The Corps would like to add excellent to the present "good, fair, and poor."

It would like to work out a grey scale with additional steps. An enlargement of the actual size of the individual samples is also being considered.

LIGHT FASTNESS *(R C Allison)*——— Mr Rizzo reported on the status of the blue standards, stating that, they would be ready in about two weeks.

Mr Schmitt reported on sunlight fastness. It was pointed out that "sun hours" is a loose definition for exposure conditions, and that the Langley Unit is being tried as a description of energy of exposure.

Mr Allison reported that C A Seibert's work was being evaluated and that good results were appearing.

Mr Norton reported on progress in exposures in the Fugit-Ometer and with the Xeon lamps. He will start outdoor selective radiation exposures in March.

ANALYTICAL METHODS *(P J Wood)* ———The Committee on Analytical Methods met on January 19th. Data was presented by five participating members on a common sample of sodium hydrosulfite analyzed repeatedly at the respective laboratories by three different methods. These methods were: the Rubino R colorimetric method, the ammoniacal copper method, and the iodimetric method. They had previously been selected as the most practicable procedures being used commercially at present.

The data indicated good precision within the individual laboratory, but reproducibility between different laboratories was, although not bad, not as good as desired. The analyses by the different methods varied somewhat as well. It was concluded that the determination of the activity of sodium hydrosulfite is highly susceptible to small differences in analytical manipulation.

The Committee is now engaged in

further investigation of these critical manipulative variables.

ATMOSPHERIC FADING *(G W Wernz)*———It was reported that work was in progress to decrease the time needed for gas-fume fading by increasing the quantity of reacting gases. Seasonal variation in "O"-fading has been reported. Service tests are being run on dyed fabrics suspected of "O"-fading.

CROCKING *(W Klaas)*———It was reported that a two-finger crock meter is now being checked for performance in seven laboratories.

NEW BUSINESS

Mr Baker mentioned that the "1-5" classification does not always run in the same direction with various tests and, therefore, it is a source of confusion. He will write to the chairmen to list possible points of correction.

Some general discussion took place on the extension of the color standards beyond 320 hours. The use of L8 plus additional added standards, such as L8 + L6 = 320 + 80 = 400 hours, could be tried.

The next meeting is planned for April 20th at the Benjamin Franklin Hotel in Philadelphia.

Respectfully submitted,
J A Woodruff, *Secretary*

ACTIVITIES OF THE LOCAL SECTIONS

NIAGARA FRONTIER

APPROXIMATELY 30 members and guests attended a dinner meeting of the Niagara-Frontier Section on Friday, January 20, 1956 at the Park Lane Hotel, Buffalo, N Y. The speaker of the evening, E M Taylor, General Dyestuff Co, New York, presented a paper entitled "Factors Influencing the Successful Application of Substantive Dyestuffs."

During the business session a committee was formed to prepare plans for a Ladies Night, tentatively set for late April.

A joint meeting of the Ontario Section, CATCC and the Niagara-Frontier Section was held on Friday March 2, 1956 at McMaster University, Hamilton, Ontario. Approximately 60 members and guests were in attendance, including 7 members of the Niagara-Frontier Section from the Buffalo area.

Feature of the evening was a talk by F Schlaeppi of Ciba Co, Ltd, Montreal, P Q, on "The Use of Newer Metalized Colors," which was illustrated by slides and numerous exhibits illustrating the application of these dyestuffs on natural and synthetic fibers. The meeting was followed by a buffet luncheon.

NEW YORK

A MEETING of the New York Section was held on Friday evening, March 2, 1956 at the Hotel Delmonico, New York. A report on "Operation Cue," a test to discover the effect of an A-bomb on textiles and clothing, was presented by Charles W Dorn and P J Fynn of the J C Penney Co and Dr Harold W Stiegler, AATCC research director. Members of the American Association for Textile Technology, Inc were guests at the meeting. The attendance was 190.

NORTHERN NEW ENGLAND

SPEAKERS at the February 17th meeting of the Northern New England Section, held at the U S Army Quartermaster Research & Development Center, Natick, Mass———(L to r): P J Fynn, J C Penney Co; Charles W Dorn, J C Penney Co; Harold W Stiegler, AATCC director of research; Allan J McQuade, chief, Textile Functional Finishes Laboratory Branch, TC&F Division, QM Research and Development Command; Stephen J Kennedy, chief, TC&F Division.

PHILADELPHIA

Thomas H Hart (left), chairman of the Philadelphia Section, presents Prof Percival Theel, director of research at Philadelphia Textile Institute, with a gavel at the latter's installation as chairman emeritus of the Section at the March 2nd meeting.

THE Philadelphia Section installed Percival Theel, director of research at the Philadelphia Textile Institute, as chairman emeritus of the Section at a regular meeting on March 2nd at the Adelphia Hotel, Philadelphia. Prof Theel received from the Section an engraved gavel as a token of this new office. Thomas H Hart, Hart Products Corp, chairman of the Section, made the presentation.

Edward C Diehl, program chairman, introduced the guest speaker of the evening, Hector C Borghetty, director of textile chemical development, Rohm & Haas Co, Philadelphia. Mr Borghetty discussed "Wash and Wear Cotton Fabrics," covering the technical, merchandising and utilitarian aspects of these fabrics.

The next regular meeting of the Philadelphia Section will be a Ladies Night Program, to be held April 20th at the Benjamin Franklin Hotel, Philadelphia.

RHODE ISLAND

THE Student Night Meeting of the Rhode Island Section will be held Tuesday, April 26, 1956 at the Rhode Island School of Design, Providence, R I. Senator John O Pastore (D—R I) and Kenneth R Fox, vice president, Fabric Research Laboratories, Inc, Dedham, Mass, will be the featured speakers at this meeting.

Membership Applications———

(Continued from page P189)

Arthur E Schaefer—Mgr, Prod Control Dept, Gen Aniline & Film Corp, Rensselaer, N Y. Sponsors: J C Moessinger, A E Herrmann, Jr.

Raymond Thornton—Tech service mgr, Arnold Hoffman & Co, Inc, Providence, R I. Sponsors: E D McLeod, A C Merrill, Jr.

JUNIOR

Donald R Cannon—Salesman, Procter & Gamble, Text Sales Div, Cincinnati, O. Sponsors: T R Smith, J B Crowe.

Suarez P Javier—Dyeing Dept, Manufacturas Sedeco, Medellin, Colombia. Sponsors: R Jaramillo, C Andel.

ASSOCIATE

John H Adams—Salesman, Kennett Equipment & Machinery Co, Kennett Square, Pa.

Paul E L Bruck—Sales repr, Stein Hall & Co, Inc, New York, N Y.

Nathan H Buschman—President, Buschman Products Inc, New York, N Y.

Madison Hunt—Research chemist, E I duPont de Nemours & Co, Inc, Jackson Labs, Deepwater Point, N J.

Willy H Kuch—Sales service supervisor, General Aniline & Film Corp, Dyestuff & Chemical Division, Rensselaer, N Y.

Dott Italo A Ottina—Agent, Biella, Italy,

John R Park—Prop, J R Park Co, Boston, Mass.

Carl N Scheinberg—Assistant converter, Wamsutta Mills, New York, N Y.

Albert L Stallkamp — Chemist & prod mgr, Shark Chaser Chemicals Co, San Pedro, Calif.

Chester J Stroemple—Director, market develop, Colombia-Southern Chemical Corp, Pittsburgh, Pa.

CORPORATE

Pyramid Mfg Co, Inc

Cabin Crafts, Inc

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

John C Bell, Jr *Donald C Dobner*

STUDENT

Monroe D Barber—Georgia Inst of Technology. Sponsor: W Postman.

Gordon K Empting—Philadelphia Textile Institute. Sponsor: W H Hughes.

William P Ironside—R I School of Design. Sponsor: H B Sturtevant.

February 24, 1956

SENIOR

Thomas Anderson, Jr—Tech service repr, J W Starkweather Co, Providence, R I. Sponsors: M J Quigley, E W Counsell.

Noah Brenner—Dir of lab, S Augstein & Co, Inc, College Point, N Y. Sponsors: E A Egerer, E Johnson.

William T Buchan—Text colorist & finisher, E I duPont de Nemours & Co, Inc, Altanta, Ga. Sponsors: L A Burroughs, A Fisher, Jr.

Albert F Chadwick—Chemist, E I duPont de Nemours & Co, Inc, Electrochemicals Dept, Niagara Falls, N Y. Sponsors: A L Parkinson, T E Bell.

James A Creech—Sec-treas, Ivey Chemical Co, Greenville, S C. Sponsors: J Ballock, Jr, C Hooper.

Joseph H Groff—Dyer, Picolet Dye Works, Inc, Montgomeryville, Pa. Sponsors: T R Scanlan, Jr, W Phiel.

Patrick J Hannan—Organic chemist, Engr Research & Develop Lab, Fort Belvoir, Va. Sponsors: N F Getchell, W M Segall.

Walter W Humecky—Industrial engr, Textile Research, Aberfoyle Mfg Co, Bridgeport, N J. Sponsors: J G Lecrone, R C Kopp.

James F Hunt—Overseer of dyeing, Woodside Mills, Liberty, S C. Sponsors: C O Stevenson, R P Anthony.

Yasukichi Kariya—Chief of Dyeing Lab, Moriroku Co, Tokyo Br, Tokyo, Japan. Sponsors: H Halvorsen, G E Neisser.

Jingoro Kimura—Chief of Nagoya Br, Kaseihin Shoji Co, Ltd, Nagoya, Japan. Sponsors: H Halvorsen, G E Neisser.

Isaac T Libn—Pres, Citation Dye Wks & Custom Hosiery Finishers, Pleasantville, N J. Sponsors: H L Steen, F W Allendorf.

Edward G Litton—Mill mgr, Litton Knitting Mills, Manila, Philippines. Sponsors: G E Neisser, H Halvorsen.

Roland J Luciano—Boss Dyer, Franklin Finish Co, Paterson, N J. Sponsors: H P Baumann, G Heine.

Ralston McArthur—Dyer, Chateau Dyers, Huntington, Canada. Sponsors: R W Redston, F D Wallace.

Robert W Miller—Head of Physical Test Lab, Wilson Bros, South Bend, Ind. Sponsors: J E Norton, B J Alport.

Allan C Milnes—Asst overseer of finishing, J P Stevens Co, Franklin, N H. Sponsors: R S Sappington, A K Innes.

James J O'Connor, Jr—U S Customs Examiner (coal tar dyes), New York, N Y. Sponsors: G H Davis, B Wright.

James T Poplin, Jr—Dyer, Sidney Blumenthal & Co, Inc, Rocky Mount, N C. Sponsors: D W Adams, D J McCartney.

SENIOR

Carl D Sickerott—Sec-treas, plant mgr, Citation Dye Works, Pleasantville, N J. Sponsors: R L Steen, F W Allendorf.

William E Stubbins—Salesman, Van Vlaaderen Machine Co, Providence, R I. Sponsors: A F McLean, L Z Therrien.

JUNIOR

Luc Louis Gregoire — Dyer, Danielson Finishing Co, Danielson, Conn. Sponsors: C P Mangion, M F Davis.

ASSOCIATE

John J Jenkins—Pres, Jenkins Peuchot Color & Chem Co, New York, N Y.

Hei Y Kwon—Managing director of Kyung-puk Textile Assoc, Taegu, Korea.

Stanley Rader—Chemist, Roma Chemical Corp, Brooklyn, N Y.

Homer Camsdell — Salesman, National Starch Products, New York, N Y.

CORPORATE

The Chemstrand Corp

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

Charles M Alberto

John G Signorino

STUDENT

Milton P Brown—Alabama Polytechnic Institute. Sponsor: J C Farrow.

David M Hall—Alabama Polytechnic Institute. Sponsor: J C Farrow.

George W Heard—Alabama Polytechnic Institute. Sponsor: J C Farrow.

Charles B Lacy—Alabama Polytechnic Institute. Sponsor: J C Farrow.

Rupert A McDaniel—Alabama Polytechnic Institute. Sponsor: J C Farrow.

J W Sherrer—Alabama Polytechnic Institute. Sponsor: J C Farrow.

John R Spivey — Alabama Polytechnic Institute. Sponsor: J C Farrow.

Gordon C Temple—Alabama Polytechnic Institute. Sponsor: J C Farrow.

Charles E Willett—Alabama Polytechnic Institute. Sponsor: J C Farrow.

Charles H Wilson—Alabama Polytechnic Institute. Sponsor: J C Farrow.

Joe D Carr—Georgia Institute of Technology. Sponsor: W Postman.

Jesse C You—Georgia Institute of Technology. Sponsor: W Postman.

Joseph A Power—New Bedford Inst of Textiles & Technology. Sponsor: W Postman.

March 9, 1956

SENIOR

Philip G Carlson, Jr—Chemist, Research Lab, Graniteville Mfg Co, Graniteville, S C. Sponsors: S Converse, H M Pinner, Jr.

Americo E Dalatri—Head dyer, Rainbow Finishing Co, Port Chester, N Y. Sponsor: J Hugenschmidt.

William C Devine—Assist dyer, The Stead & Miller Co, Concord, N C. Sponsors: A R Thompson, J L Lancaster.

William J Fulkerson—Supt finishing, Neisler Mills, Kings Mountain, N C. Sponsors: J N Grant, M A Stough.

Hermon A Goforth — Package & beam

dyer, Neisler Mills, Div Mass Mohair & Plush Co, Kings Mountain, N C. Sponsors: J N Grant, M A Stough.

Seymour F Goodheart—Research director, Frederick H Levey Co, Inc, Brooklyn, N Y. Sponsors: B Hodes, E Ehas, Jr.

Douglas L Haislip—Assistant dyer, Cone Finishing Co, Greensboro, N C. Sponsors: T S Blackwood, G Brandt, Jr.

Ermon C Martin — Piece dyer, Neisler Mills, Div Mass Mohair Plush Co, Kings Mountain, N C. Sponsors: J N Grant, M A Stough.

Francis X Minich — Salesman, Metro-Atlantic, Inc, Greenville, S C. Sponsors: W E Iannone, J C King.

Henry N Myers—Assist dyer, Cone Finishing Co, Greensboro, N C. Sponsors: G Brandt, Jr, T S Blackwood.

Antoni Nockowski—Wool dyer, Berven Rug Mills, Inc, Fresno, Calif. Sponsors: C B Fieldhouse, E Mayer.

Angelo V Porta—Textile colorist, General Dyestuff Co, New York, N Y. Sponsors: C Z Draves, H Halvorse.

Frank W Smith — Asst supt, Standard Coosa Thatcher Co, Chattanooga, Tenn. Sponsors: J C Whitt, W H Bass, Jr.

Clark E Snook—Tech sales, Nopco Chemical Co, Harrison, N J. Sponsors: D W Snyder, W E Brewer.

Nicholas W Somma—Supt of dyeing, Canadian Corduroys Ltd, St Hyacinthe, Que, Canada. Sponsors: R W Redston, N G Koehler.

Ralph P Thomas—Piece dyer, Neisler Mills, Div Mass Mohair Plush Co, Ellenboro, N C. Sponsors: J N Grant, M A Stough.

William J Trimble, Sr—Supt, Trico Dyeing Co, Philadelphia, Pa. Sponsors: J McChesney, J A Clark.

Leonard A Trimble — Supt of dyeing, Trico Dyeing Co, Philadelphia, Pa. Sponsors: J McChesney, J A Clark.

ASSOCIATE

Abbott Robinson — Purchasing agent, Rainbow Finishing Corp, Port Chester, N Y.

Alcide Sala—Porto, Portugal.

CORPORATE

Cabin Crafts, Inc

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

Harry J Demas
Lloyd R Greenwood

STUDENT

William B Astle, Jr—Bradford Durfee Technical Institute. Sponsor: J Watters.

Leo F McGoff, Jr—New Bedford Institute of Textiles & Technology. Sponsor: F Tripp.

NOTICE

To Local Section Officials

To ensure that the activities of your Section receive proper publicity in the Proceedings, it is desirable that material be submitted direct to American Dyestuff Reporter, 44 E 23rd St, New York 10, N Y.

ADVANCE NOTICES OF MEETINGS———Copy must be submitted *at least two weeks* prior to the publication date. ADR is published on alternate Mondays. It is urged that the dates be taken into consideration when copy is submitted.

Advance notices should include the date and site of the meeting; the speaker's name, position, business affiliation, and subject; a short abstract of the paper (optional); details of additional meeting highlights, eg, nominations or election of officers, special awards, activities of Sectional committees, etc.

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". . . this monograph should be in the hands of every user of vat dyestuffs, every student and every teacher. The book is well indexed and includes valuable lists of equivalent trade names. It will certainly take its place as a standard book of reference."—*"JOURNAL OF THE SOCIETY OF DYERS AND COLORISTS* (England).

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(Continued from page P189)

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February 24, 1956

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News of the Trade

• Imperial to Manufacture Colors in Canada

Imperial Paper and Color Corporation, Glens Falls, New York, has announced its plans to manufacture a line of chemical pigment colors in Canada. A subsidiary Canadian corporation is being formed and a plant has been purchased in St Johns, Quebec.

Plans are being made to manufacture many of the same basic pigments that Imperial is now making in its Glens Falls plant. The colors now being made in Glens Falls are currently being sold in Canada through Imperial's subsidiary, Glens Falls Color Export Corporation, a western hemisphere sales organization.

Production will be started as soon as equipment can be installed in the St Johns buildings. It is expected that ultimately the Canadian corporation will take over most of the sales now handled by the Glens Falls Color Export Corporation. However, any Imperial colors which may not be made in Canada will still be available through the export subsidiary.

• 5th Southern Municipal and Industrial Waste Conference

The theme "Water Resources and Waste Disposal Requirements" will highlight the Fifth Southern Municipal and Industrial Waste Conference, which will be held April 5-6 at the School of Public Health, Univ of North Carolina, Chapel Hill. Following a keynote address by Prof Gordon M Fair of Harvard University on the theme, there will be a general session Thursday, April 5th, on quantity and quality requirements for drinking, bathing, fishing, agricultural and industrial waters. On Friday afternoon, April 6th, a general session will be devoted to methods for establishing waste disposal requirements. Representatives from industry, regulatory agencies and consulting engineering will present papers at this session. Separate technical sessions will be held on Friday morning, covering (1) Textile wastes; (2) Chemical industry wastes; (3) Food processing wastes; and (4) Municipal wastes.

The session on Textile Wastes will feature the following papers: "Aeration and Holding of Cotton Finishing Mill Wastes," Nelson L Nemerow, North Carolina State College; "Experience with the Substitution of CMC for Starch," Duane Snyder, Crompton-Shenandoah Co; and "Experience with Flue Gas and Lagooning for Alkaline Dye Wastes," C J Beach, U S Rubber Co. Additional papers, as yet unannounced, are planned for this session.

This picture, taken near the processing towers for pyrrolidone, butyrolactone and propargyl alcohol, at the new Calvert City, Ky, acetylene chemicals plant of General Aniline & Film Corporation, shows (left to right) O W Schnetzler, assistant project director; F Wuerth, project director; vice president P M Dinkins, in charge of the Company's Dyestuff and Chemical Division; and Hans Beller, recently appointed plant manager for the new $6,000,000 development. Dr Beller had been project director during the construction phases at the plant.

The two shorter towers (about 40 feet high) are for the processing—the separation and purification—of pyrrolidone. The taller tower (60 feet high) to the rear center of the first two is for processing butyrolactone, and the towers in the right background are for propargyl alcohol. At the left and directly behind Mr Schnetzler is a butanediol tower. Three of seven steps in the manufacture of these products are taken in this section (the north process area) of the new plant.

The entire plant was designed and constructed on the basis of processing and manufacturing experience gained at the Company's pilot plant in Linden, N J. The plant features all outside construction except the controls and compressors, which are housed in a "control room," the low building to the left.

The line of acetylene products has been produced on a semicommercial scale at Linden and will be manufactured in full commercial quantities for the first time in this country at Calvert City.

• Philadelphia QM Depot Begins 14-Week Course

The Philadelphia Quartermaster Depot, in conjunction with the Philadelphia Textile Institute, commenced a fourteen-week course entitled "Textile Technology and Clothing Manufacture" on Wednesday, March 7, at the Quartermaster Depot.

Robert C Bokum, director of the PTI Evening School, who is acting as coordinator of the course, provides brief introductory remarks for each session. The classes are being conducted by the faculty of PTI.

Areas to be covered in the course include the following: Introduction to Textile Industry, Textile Fibers, Yarn Manufacturing, Visit to Textile Institute Laboratories, Fabric Identification, Fabric Design and Construction, Principles of Weaving, Dyeing of Textiles, Finishing of Fabrics, Review of Textile Processing at Textile Institute, Economics of Clothing Industry, Design Engineering of Clothing, Fabrication of Clothing, and Finishing Operations.

The text used for the course will be Potter & Corbman's "Fiber to Fabric."

• Alco Purchased for Undisclosed Sum

A group of Cleveland investors and management specialists has purchased, for an undisclosed sum, Alco Oil & Chemical Corporation of Philadelphia, 28-year-old manufacturer of latex chemical compounds.

This was announced by Arthur E Jones, one of the founders, vice president and treasurer, who continues as vice president under the new ownership. Other than addition of three officers to fill vacancies, no changes in personnel or policies are contemplated, Jones stated.

New officers of the company are William H Coleman, chairman; Tinkham Veale II, president and treasurer; and A A Augustus, secretary.

Edna M Jones, who has been secretary of Alco, becomes assistant treasurer under the new arrangement. She is the wife of Vice President and Founder Jones.

In addition to the new officers, the purchasing group includes other partners in Ball, Burge & Kraus, headed by Peter Ball, senior partner.

President Veale believes that Alco Oil & Chemical Corporation is on the verge of a substantial expansion program growing out of new products developed by the company's research department.

Organized in 1928, Alco Oil & Chemical Corporation has become one of the nation's major producers of latex chemical compounds. Starting as a one-man laboratory, the company has expanded into a continuous process manufacturing operation, with annual sales of about $5 million.

The company has two plants in Philadelphia, one at Trenton Avenue and William Street and one at State Road and Unruh Street, as well as warehouse and representative offices in New England, California and Akron, Ohio.

• Ahco Consolidates Northern Sales Territories

Consolidation of its New England sales territory with the Teterboro, N J, sales territory has been announced by Arnold, Hoffman & Co, Inc. Headquarters for the new regional concentration, now designated "Northern Territory," is at 370 North Street, Teterboro, N J.

Leonard G Tubbs is sales manager for the Northern Territory. Customers have been requested to direct routine orders and correspondence to the Teterboro office. Complete sales and technical service facilities are available at that location.

The services of the regular Order Control and Technical Service Departments at Arnold, Hoffman's Providence, R I, home offices are still available, however, to New England customers who prefer to telephone their orders or inquiries, or who require immediate technical service.

• Union Carbide Forms Development Company

Union Carbide Development Company has been formed as a new division of Union Carbide and Carbon Corporation. Long-term corporate planning and evaluation of new business opportunities will be important objectives of the new Company.

Operating Divisions of the Corporation will continue, as in the past, to carry on their own research and development activities in Union Carbide's seven major fields of activity.

Birny Mason, Jr, secretary of Union Carbide, has been appointed president of the new Company. R E Cornwell, E J Fox, and J J Murphy have been named vice presidents. All of the new officers have been associated with the Corporation for many years.

• New Nopco Scholarship Honors Founder

A four-year college scholarship, to be called the Charles P Gulick Scholarship after the late founder of the Nopco Chemical Company, has been established by the Board of Directors of Nopco.

The scholarship, having a value of $750 per year for four years, will be awarded annually to the son or daughter of a Nopco employee.

Candidates will be judged by the Nopco Scholarship Committee on the basis of scholastic achievement, financial need, character, and well-rounded personality. The committee consists of Prof Charles O Beckman, Columbia University, Dr Evald B Lawson, Upsala College, and George Kramer of Rutgers University.

• Emkay Introduces New Employee Benefits Program

A program providing employees with noncontributory life insurance and retirement incomes has been announced by Emkay Chemical Company, Elizabeth, N J.

The plan, the complete cost of which will be borne by Emkay, will provide employees with a regular retirement income starting at the age of 65, and complete life insurance protection equal to at least 100 times the monthly premium.

Retirement income, which starts at 65, will be based on an employee's monthly pay and will not be affected by Social Security benefits. It also provides a monthly income for a period of up to 10 years to beneficiaries of retired employees.

To be eligible, employees must have at least 3 years service with the company and be between the ages of 23 and 55.

• New Hermas Representatives

Hermas Machine Co, Hawthorne, N J, has appointed the following representatives for its line of textile machinery:

New England———Harris and Underhill, 446 Statler Bldg, Boston, Mass (Carl W Harris and Donald P Underhill)

Middle Atlantic States———James A Love, 75 West St, New York, N Y.

In addition to Harris and Underhill, the following have been named representatives for Hermas' Jet Mixer line:

Southern Illinois and Eastern Missouri———Vollmer Industrial Sales Co, 847 Swarthmore Lane, St Louis 24, Mo.

Wisconsin———J W Copps, Inc, Box 116, Station F, Milwaukee, Wis.

• Training Course in Industrial Wastes

A tuition-free course in "Analyses of Metals and Cyanides in Industrial Wastes" will be given May 8-10 at the Robert A Taft Sanitary Engineering Center, Cincinnati, Ohio. Industrial and governmental representatives are invited to attend.

Application forms, which should be submitted at least four weeks before the opening date of the course are obtainable from the Center, from the Public Health Service in Washington, D C, or from any regional office of the Service. Detailed agenda and other information will be furnished to interested persons.

• Swiss Textile Equipment Exhibition to Feature New Designs

A large group of Swiss textile machine manufacturers will be displaying their latest designs at Basel April 14-24 at the Textile Equipment Exhibition, which will be held in a separate hall during the 40th Swiss Industries Fair.

In the dyeing and finishing area, various high-temperature equipment will be on display, including one layout with a "control point" in which all the control and supervision members are combined. Another innovation is the "Turbinator," which accelerates the various processes involved in wet finishing. Reference may also be made to recently developed pad-dyeing, impregnating and dressing machines and to new cloth-inspection machines. Advances have also been made in the construction of testing apparatus, and visitors to the Fair will be able to see, for instance, an instrument which is designed to measure the water content of textiles and determine moisture equilibrium by an entirely new method. Finally, there is the versatile Projektina-Apparatus-S.

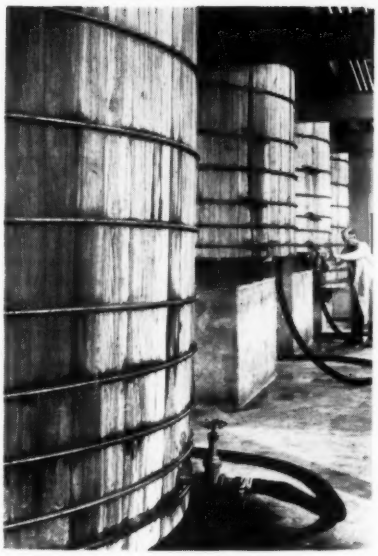
• Peerless Completes New Azo Unit

The Peerless Color Co, Inc, Plainfield, N J, has announced the completion of a new azo unit, the entire structure of which was engineered by Walter Chung, Peerless' research director.

A former storage building was taken over for this purpose, the shell of which is twenty-eight feet high. Provisions were made in the construction plans so that production capacity can be trebled, if need be, by overflooring each tier and adding the necessary equipment.

Production of a line of direct resinfast colors is now in process in this unit.

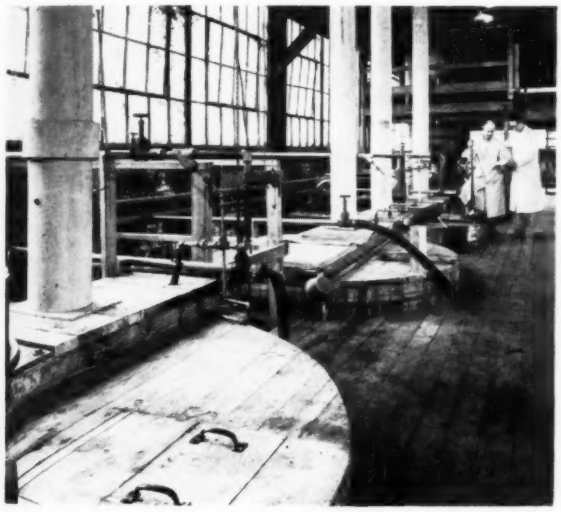
Peerless manufactures vat and direct dyes. The management of the company intends to follow along the lines of specialization set forth by Dr R W Cornelison, who founded the concern in 1916.



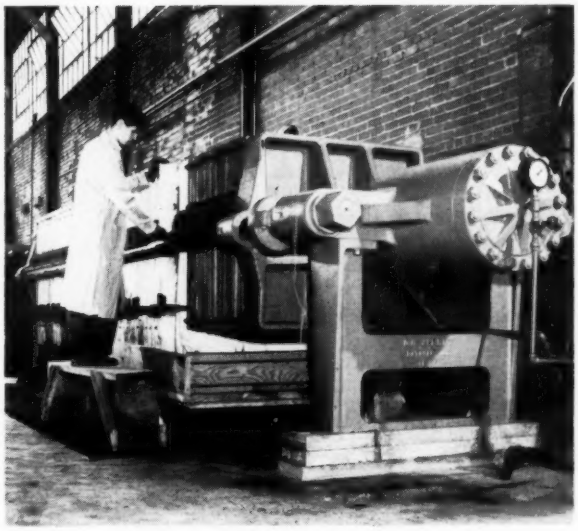
Tanks plus

ADR AVAILABLE ON MICROFILM

Arrangements are being continued with University Microfilms, 313 North First Street, Ann Arbor, Michigan, for supplying subscribers of the Reporter with a microfilm edition. This arrangement was effective with the 1952 volume. The film copy will be delivered at the end of the volume year for those who subscribe to the service and it will include all issues published during that period. It is estimated that the film edition requires only 5% of the space required for the paper edition, which is bound. Complete information is available from University Microfilms.



Partial view of 2nd floor



One of the new 42-inch hydraulic presses

Book Review——

(Concluded from page 188)

of textile fibers, and approximately 300 tables and 100 graphs are used to present information to the reader. A factor of considerable interest to the serious worker is the inclusion of the original source for most of the data presented in the book.

The one thing that struck this reviewer about this Handbook was the completeness of the information contained between its covers, and the excellence of the index as the key to the contents. As with any volume of this type, and especially in connection with the first edition, there are a few minor omissions. For example, while modulus of elasticity is defined in terms of its classical or engineering definition, the usual textile concept is not referred to in that secant modulus, tangent modulus, and stiffness (de Witt Smith) are not defined. In addition, while resilience is defined, elastic performance coefficient is not, nor is toughness. The listing of man-made fibers really makes one aware of the tremendous number of compounds that man has attempted to fabricate to replace, supplement, or extent the fibers supplied by nature, however, three omissions of which this reviewer is aware were made: Aralac (but possibly because it is not commercially made any longer), nylon 11 or Rilsan, and Kuralon. Rilsan, while still undergoing production problems, is represented in the US by means of a Boston office, and has been for over two years. While other Japanese polyvinyl alcohol fibers were listed, notably Vinylan and Vinylon, Kuralon was not, although it dates back at least four years.

These foregoing omissions, among possibly others of a like nature, are minor in the extreme, and in no way detract from the value of the Handbook. Within the feeble means available to this reviewer for checking, the Handbook seems to be remarkably free of errors of any nature, and thus its value as a primary source of information is greatly enhanced.

To sum up, here is a volume that lives up to the promise of its title of being a Handbook of Textile Fibers. It is a volume that should be in the library of every textile laboratory. In fact, it should be on the desk of every individual engaged in textile design, evaluation, testing, and research work, for even one month of use will prove the library to be too far away. —JKF.

• NEW PRODUCTS AND DEVELOPMENTS •

• Perma Kleer 80 Crystals

Refined Products Corporation, Lyndhurst, N J, has announced an improved dry form of Perma Kleer 80 called Perma Kleer 80 Crystals, a nonhygroscopic product suitable for dry mixtures.

The pure Perma Kleer 80 combines with water (as water of crystallization) to form a characteristic crystal which is no longer hygroscopic. This development reportedly has eliminated the undesirable features of the conventional drum or spray dried product, such as caking during storage, picking up moisture on exposure to humid atmosphere, or causing mixtures of powdered soaps or detergents to become hygroscopic where a sequesterant is incorporated.

RPC points out that lower chelating values would be expected due to the incorporation of water of crystallization into the molecule, but the opposite is true. Because of the purification which takes place during the process of crystallization, it is claimed, the content of active chelating agent is higher than in any other form offered commercially. This is said to be beneficial to the consumer as evidenced by greater chelating efficiency, nonvarying pH because excesses of Na^+ are eliminated, and stable assay because sodium ion, acid, and water content are held in exact ratios by the crystalline structure.

This product reportedly forms stable chelates with all divalent metal ions and most trivalent metal ions. Ferric ion is chelated in acid and neutral media.

The Perma Kleer 80 sequestering agents have been available for textile, cosmetic, pharmaceutical, and general industrial use for the past few years. Refined Products Corp states that their exceptional adaptability for the sequestration of iron in either acid or alkaline medium, as well as calcium and magnesium, has helped RPC customers to solve many problems.

• Barisol BRM

Staining and resist spots often caused by the redeposition of dirt and insoluble materials on cotton goods during the continuous peroxide bleaching of cotton goods can be effectively combatted through the use of Barisol BRM, according to Dexter Chemical Corp, New York.

The high dispersal powers of Barisol BRM, a phosphated compound developed by Dexter, is said to prevent the formation of scum and dirt in both the caustic and peroxide saturator.

As little as 0.25 to 0.5% of Barisol BRM on the weight of the liquor in the caustic saturator not only speeds up the action of the caustic on the goods but helps to bring about a more thorough removal of foreign material in the subsequent washing operation, it is claimed.

In the peroxide saturator, 0.1 to 0.5% of Barisol BRM will insure penetration and maximum reaction of the peroxide with the coloring matter in the goods, the firm reports. The accumulation of insoluble silicates and phosphates on equipment in this phase of the operation is often a problem. Barisol BRM is said to prevent build up of these hard products on machinery and equipment.

• Accelerated Soil Tester

The Accelerated Soil Tester developed by the Textile Resin Department of the American Cyanamid Company, Bound Brook, N J, is now being manufactured and distributed by Custom Scientific Instruments, Inc, Kearny, N J. This unit provides a method of soiling the specimens for the evaluation of soil-retardant finishes on carpeting and fabrics. The ball mill soiling apparatus rotates at 60 rpm with direction of rotation reversing every two minutes.

The soil is distributed by placing a weighed amount in a perforated steel capsule along with steel balls. As the ball mill rotates, the soil is uniformly deposited on the fabric samples. The ball mill is equipped to hold four samples of carpeting or fabric, each sample size 5" x 5".

After the samples have been soiled, they are removed, vacuumed, and the soiling is determined by a reflectance meter.

Tests with the Accelerated Soil Tester have been correlated with actual floor tests by Cyanamid's Textile Resin Department.

• National Solantine Blue Green BFL

National Solantine Blue Green BFL is the latest addition to National Aniline's line of nondusting, lightfast direct dyes producing, on cotton and rayon, bright bluish-green shades, which reportedly may be discharged to an excellent white with neutral and alkaline discharge pastes. It is said to exhibit excellent fastness to light, rubbing, alkalis, drycleaning, sea water and water; very good fastness to washing and perspiration; and good fastness to acids, mercerizing and hot pressing. This product is claimed to be suitable for coloring cotton carpet yarns, hosiery, upholstery, suitings, materials to be rubberized; and for dyeing leather.

Spécialisation

— FRENCH FOR

SPECIALIZATION

IN ANY LANGUAGE,

PEERLESS MEANS SPECIALIZATION

PEERLESS COLOR COMPANY, INC.

521-535 North Avenue, Plainfield, New Jersey

Manufacturers of Dye Colors since 1916

Export Representative: Herbert Lorenz, Inc., World Traders

299 Madison Avenue, New York 17, N. Y.

Cables: HACOLORENZ

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